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EVALUATION DES POSSIBILITES D'EMPLOI D'UNE MAIN-D'OEUVRE A FORMATION RAPIDE DANS LES PAYS EN VOIE DE DEVELOPPEMENT

Par l'Association Nationale Interprofessionnelle
pour la Formation Rationnelle
de la Main-d'Oeuvre

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NOTES

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2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

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EVALUATION DES POSSIBILITES D'EMPLOI D'UNE MAIN-D'OEUVRE A FORMATION RAPIDE DANS LES PAYS EN VOIE DE DEVELOPPEMENT

Association Nationale Interprofessionnelle pour la Formation Rationnelle de la Main-d'Oeuvre (A.N.I.F.R.M.O.) - FRANCE -
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I - Considérations Générales

II - Quelques réalisations d'opérations de formation rapide dans les pays ou régions en voie de développement avec le concours de l'A.N.I.F.R.M.O.

III - Les règles essentielles pour l'efficacité de la collaboration avec l'A.N.I.F.R.M.O.

IV - Conclusion

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1 - CONSIDERATIONS GENERALES

L'Association Nationale Interprofessionnelle pour la Formation Rationnelle de la Main-d'Oeuvre, héritière d'une série d'expériences de Formation Professionnelle d'Adultes (hommes et femmes) faite en France, depuis 1935, et notamment de 1938 à 1940 (1), sous le nom de Formation Professionnelle accélérée, dispose d'une série de moyens, grâce, notamment à l'Institut National de Formation Professionnelle, propres à faciliter les possibilités d'emploi d'une main-d'oeuvre potentielle, quel que soit le secteur d'activité industriel, commercial, administratif, demandeur.

Les progrès scientifiques, qui se multiplient sans cesse, entraînent dans un pays industrialisé de nombreuses et permanentes reconversions de main-d'oeuvre. La décentralisation d'entreprises de trop vastes agglomérations urbaines, vers des zônes peuplées, nanties de demandeurs d'emplois, mais sans qualification professionnelle adaptée, pose aussi le problème de la formation rapide. L'impossibilité de nantir certains métiers d'ouvriers capables, à partir de l'apprentissage des adolescents quand il s'agit de fonctions trop pénibles par exemple (2) exige également la mise au courant du personnel nécessaire par une instruction professionnelle rapide d'adultes etc ...

C'est ainsi que la France a dû se doter d'un réseau de système de Formation Professionnelle d'Adultes ouvert à ceux qui ont au moins 17 années d'âge, aux caractéristiques complètement différentes de l'instruction des jeunes garçons et des jeunes filles.

La F.P.A., pour être efficace, doit pouvoir disposer d'une doctrine pédagogique unitaire : parallèlement, elle doit mettre en place des conditions de réalisations aussi diverses que les objectifs à atteindre. Egalement la F.P.A. ne doit jamais être une copie, un résumé, un "digest", de l'apprentissage des adolescents. C'est parce que ces conditions fondamentales sont réunies en France, que l'aide de l'A.N.I.F.R.M.O. a pu être fournie aux pays en voie de développement qui se sont adressés à elle (3)

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(1) - pour situer un seul fait : en 1939, au début de la deuxième guerre mondiale, sous l'égide conjointe des Ministères du Travail et de l'Armement, la Formation Professionnelle accélérée, dans les établissements industriels du Ministère de la Guerre, d'une population masculine indochinoise, mobilisée en France (les pays d'origine de ces ressortissants étant alors colonies ou protectorats français), fut entreprise pour tenir des postes de travail sur les machines-outils de la mécanique.

(2) - Quand le code du travail a fixé des règlements de protection - Certains emplois de la sidérurgie en particulier.

(3) - Sans vouloir trop insister sur cet aspect des choses, on peut dire que des institutions permanentes de F.P.A., adaptées aux conditions de l'endroit ont été conçues dans des régions en voie de développement, sous contrôle français et qui maintenant servent ou vont être utilisées par des états nouvellement indépendants : Congo ex-français et Algérie surtout. Il s'agit bien là de "zônes en voie de développement.

C'est autour de l'Institut National de Formation Professionnelle (1) liant à la fois, d'une part, Ecole de Formation Pédagogique de moniteurs et de directeurs d'institutions et de centres de Formation Professionnelle d'Adultes, et d'autre part, organisme d'étude de recueils d'instruction pratique et technique nécessaires à ces F.P.A. que ces liaisons ont pu s'établir.

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(1) - plus loin, dans le texte, lire I.N.F.P.

II - QUELQUES REALISATIONS D'OPERATIONS DE FORMATION RAPIDE DANS LES PAYS EN VOIE DE DEVELOPPEMENT AVEC LE CONCOURS DE L'A.N.I.F.R.M.O.

Les relations s'instaurent, au début, pour concevoir une opération (1) de Formation Professionnelle, soit par la voie des Autorités Gouvernementales des Etats intéressés et de la République Française, soit par le canal de Sociétés privées de ces Etats ou installées dans ces pays et le Ministère du Travail français, administration publique, tutelle de l'A.N.I.F.R.M.O.

Pour mieux montrer les possibilités offertes et les résultats déjà obtenus, quelques opérations déjà réalisées, choisies par les plus typiques pourront servir d'exemples. Ils sont donc résumés ci-après, dans le domaine de leurs diverses étapes techniques. En 1956, une Compagnie industrielle française passait des accords avec le Pakistan pour édifier et mettre en état de fonctionner une usine de l'industrie chimique.

Dans ce premier stade, le schéma général de la mise en route de l'usine (étapes et délais) lui ayant été communiqué, l'A.N.I.F.R.M.O. eut à instruire une série d'ingénieurs français de divers groupes professionnels (chimistes, électriciens, mécaniciens, travaux publics ...) tous parlant anglais, les problèmes spécifiques de la F.P.A. au cours d'un stage de trois semaines, suivi de travaux de préparation des progressions d'exercices (2) propres à la formation professionnelle des ressortissants pakistanais des diverses catégories qui devraient travailler dans la nouvelle usine. Ces ingénieurs effectueraient ces tâches avec l'aide du professeur de l'I.N.F.P., chargé du stage dont il a été parlé ci-avant, sous les directives de directeurs français et la COmpagnie ayant mené préalablement des enquêtes sur place. La mise au point des progressions d'exercices fut facilitée par l'utilisation de documents établis à l'usage des travailleurs français. Elle tient compte aussi des caractéristiques pakistanaises communiquées par les autorités de ce pays et par des spécialistes de la psychotechnique ayant effectué diverses tâches de sélection de main-d'oeuvre au Pakistan (3).

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(1) - Au lieu de ce mot, on emploie souvent le terme de programme dans le langage international. Comme ce dernier mot prête à équivoque avec l'énoncé des matières enseignées dans une formation professionnelle déterminée, il a été écarté dans ce mémoire.

2) - Par progression d'exercice, il faut comprendre les recueils de tous les travaux successifs élémentaires et de synthèse qui doivent être enseignés à un candidat d'une catégorie du poste de travail, ou d'un emploi déterminé pour l'amener au niveau de qualification professionnelle (compétence et rendement) envisagé.

(3) - Au cours des enquêtes fondamentales, un psychologue du travail français se rendit sur place et examina avec les futurs directeurs de l'opération de lancement de l'usine, les divers groupes et catégories de travailleurs candidats à l'emploi pour établir des "profils psychotechniques.

Pendant ce temps, un choix fut opéré par la Société industrielle, d'ouvriers et de techniciens français, très qualifiés, dont les services d'entretien et de production de la nouvelle usine devraient avoir besoin, comme agents d'encadrement (1). Ces personnes furent, à leur tour, formées, à l'I.N.F.P., comme moniteurs, au cours d'un stage pédagogique de six semaines.

Parallèlement au Pakistan, s'effectuait le tri d'une cinquantaine d'autochtones, ayant fréquenté des écoles professionnelles, des universités, ou ayant reçu une formation "sur le tas", dans l'artisanat ou dans quelques petites industries un peu mécanisées. Ces sujets, parlant anglais, furent dirigés sur la France. Là, les moniteurs leur donnèrent pendant six mois, à l'aide des progressions d'exercices élaborées par les ingénieurs, une formation professionnelle rapide, systématique. Le centre de formation était situé à l'intérieur même d'une usine de l'industrie chimique. Les études comportaient outre les travaux d'atelier ou de laboratoire, auxquels étaient joints des développements technologiques, et l'entraînement à la lecture des dessins et schémas d'usage, diverses visites à des services industriels comparables à ceux dans lesquels seraient employés les travailleurs en formation, ainsi que quelques courts séjours dans ces mêmes ateliers de production.

La juxtaposition de l'école et de l'usine chimique concourut à rendre plus réaliste la formation professionnelle et l'adaptation à la vie même du métier.

Ces moniteurs français et leurs élèves pakistanais furent, au Pakistan, les premiers installateurs des ateliers et des laboratoires. Les moniteurs européens devinrent ultérieurement moniteurs-chefs. Ils donnèrent à leurs anciens élèves pakistanais des indications pédagogiques et ceux-ci, destinés à devenir plus tard, la première maîtrise de l'usine en marche, au départ des Français, furent les instructeurs de la main-d'oeuvre autochtone embauchée par groupes successifs ...

En 1959, un groupe industriel français, dans le cadre d'accords passés avec la Guinée, à l'époque encore territoire à statut colonial, fit donner une formation pédagogique complète, à l'I.N.F.P. à un groupe de professionnels français hautement qualifiés de la mécanique et de la chaudronnerie, destinés à devenir moniteurs pour donner une formation professionnelle, à divers échelons, à des ressortissants guinéens de la région de Fria, où devait s'édifier un complexe industriel d'extraction et de traitement de minerais.

En 1961 et 1962, des autorités de la république Fédérale Populaire de Yougoslavie, envoyèrent, par l'intermédiaire du Bureau International du Travail, deux groupes respectivement de 48 et de 7 personnes (2) pour suivre un stage d'une durée de quatre semaines.

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(1) - Les postulants devaient parler suffisamment la langue anglaise. Ils suivirent un "cours accéléré d'entraînement" pour parfaire des notions le plus souvent scolaires et arriver au langage simple courant.

(2) - Groupes accompagnés d'interprètes parlant français.

L'I.N.F.P. eut, dans ces conditions, à former du point de vue pédagogique et à documenter des responsables de services de productivité des chefs de centres de F.P.A., des directeurs d'Instituts régionaux de formation de moniteurs professionnels. Les séances de cours permirent des études précises, dépassant évidemment les généralités afin d'être efficaces, allant des problèmes de la formation des moniteurs aux règles de la mise au point des progressions d'exercices de divers échelons pour former des techniciens (1), des ouvriers professionnels (2), des ouvriers spécialisés (3).

En 1956, pour les industries du Bâtiment et des Métaux, et en 1962, pour l'Agriculture et l'Elevage, l'Etat Espagnol fit appel à l'A.N.I.F.R.M.O.

Pour chaque famille professionnelle, un professeur spécialiste de l'I.N.F.P., fut dépêché en Espagne durant quelques semaines pour faire connaissance, dans le milieu même, avec les conditions de travail, d'activité et avec dans ces trois secteurs des projets ayant des influences sur la qualification de la main-d'oeuvre.

En relation constante avec les personnalités espagnoles chargées de la création effective de la F.P.A. (ingénieurs - techniciens et juristes pour les questions d'organisation administrative et législative), ils purent ainsi constituer de véritables groupes de travail, à l'échelon le plus élevé de l'exécution.

Professeurs de l'I.N.F.P. et cadres supérieurs Espagnols de la future F.P.A. se réunirent ensuite à Paris. Ils examinèrent cette fois d'abord, les conditions techniques du travail en France, dans des usines pour le travail des métaux, sur des chantiers pour le bâtiment et dans des exploitations rurales pour les problèmes de l'agriculture. Dans ce dernier cas, le groupe se rendit dans le Sud-Est du pays (bassin méditerranéen où les analogies de sols et de climats peuvent être facilement faites avec certaines régions de l'Espagne). En relevant les identités, les similitudes, les divergences, les idées se fixèrent pour concevoir les normes et les définitions des qualifications professionnelles à obtenir par la F.P.A. en Espagne.

Ensuite, sous l'autorité du professeur de l'I.N.F.P., dans chaque famille professionnelle, un stage de trois semaines se déroula, à Paris, au cours duquel les ressortissants espagnols furent formés comme professeurs pour la partie pédagogique et construisirent les schémas des progressions d'exercices à appliquer pour la F.P.A. espagnole, à partir des documents mis à leur disposition et en tenant compte des particularités de leur pays.

Les cadres espagnols, à leur retour, participèrent à la création des instituts pédagogiques de formation de moniteurs. L'un pour les métaux et le bâtiment fonctionne, à Madrid depuis 1958, l'autre pour l'agriculture se met en place présentement.

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(1) - Collaborateur d'ingénieurs ou agents de bureaux d'études et d'organisation.

(2) - Ouvriers qualifiés connaissant complètement un métier, ouvriers encore appelés en France spécialistes ou qualifiés.

(3) - Ouvriers appelés aussi manoeuvre spécialisés, autrement dit capables d'exécuter les opérations propres à un poste de travail d'un niveau toujours au dessous de l'examen de fin d'un apprentissage.

Les professeurs de l'I.N.F.P. eurent la charge des premières sessions de formation de moniteurs espagnols, avec le concours des "cadres espagnols" antérieurement instruits, devenus leurs collaborateurs dès la première heure et jouant le rôle de moniteurs chefs ou d'aide professeurs, avant de devenir professeurs de pédagogie professionnelle en titre et d'agir complètement de leur propre chef. Les professeurs de l'I.N.F.P. assurent ensuite des missions de liaison allant en s'espaçant, jusqu'au moment où leur concours n'est plus nécessaire. A partir de ce moment, il suffira d'assurer, si les deux parties sont consentantes, des colloques destinés à entretenir les relations établies et à permettre des échanges de vues fructueux sur les expériences et les résultats.

Un fait particulier mérite d'être noté. Les autorités espagnoles, avec la mise en place et le fonctionnement normal de l'institut pédagogique de moniteurs pour les industries des métaux et du bâtiment, disposaient d'une organisation propre à faciliter la mise au courant d'une équipe créatrice de la F.P.A. pour l'agriculture. Pour éviter toute interprétation et toute possibilité de déviation d'une doctrine de formation rapide ayant fait ses preuves, elles préférèrent retourner aux sources et faire de nouveau appel à l'A.N.I.F.R.M.O.

Après ces quelques narrations concernant des programmes généraux réalisés, il reste à dire que chaque année viennent, isolément, ou en petits groupes pour chercher des solutions à des problèmes d'ensemble ou à des questions particulières entre 50 et 100 délégués de nations les plus diverses. De cette façon, l'action de l'A.N.I.F.R.M.O. et de ses services techniques, le principal étant en la matière, comme on l'a déjà vu précédemment, l'Institut National de Formation Professionnelle aura été exposée et la diversité de ses possibilités de concours aura été mise suffisamment en évidence.

Là encore, quelques exemples, brièvement relatés, peuvent être utiles à fixer les idées.

- La République Tunisienne confia un programme de formation de moniteurs de centres professionnels pour les industries de la mécanique et de l'électricité.

Suivant les effectifs de candidats moniteurs envoyés dans chaque métier et les périodes de l'année, l'I.N.F.P. intégra les postulants dans son calendrier général ou organisa des sessions spéciales. La vérification des connaissances pratiques et techniques des élèves moniteurs fut opérée par une série d'essais et d'épreuves écrites et de dessin, tout comme pour des candidats français, et quand le besoin s'en fit sentir, des perfectionnements de plus ou moins longues durées eurent lieu, dans des centres de F.P.A. français.

- La République Argentine envoya à plusieurs reprises, sur la recommandation d'experts du Bureau International du Travail, en mission dans cet état, un ou deux techniciens de la transformation des métaux, à l'I.N.F.P. pour un séjour de six mois. Durant ce temps, ces agents furent formés comme moniteurs pour la formation d'ouvriers professionnels et aussi comme moniteurs pour la promotion en usine d'ouvriers hautement qualifiés. Plusieurs ressortissants argentins furent instruits comme professeurs d'institut de formation de moniteurs. Pour cela, après avoir reçu la formation de moniteur professionnel dans leur spécialité technique propre, ils collaborèrent à tous les actes de la vie de l'I.N.F.P. la seule condition préalable reste une connaissance suffisante de la langue française.

- Les deux Républiques Congolaises dépêchent, de te ps à autre, certains de leurs citoyens pour recevoir la formation de moniteur.

- Peut-être, n'est-il pas inutile, avant de clore ce chapitre, de citer, si l'on peut dire, comme référence intéressante, une tâche accomplie tout récemment, en 1962.

Il s'agit, en l'occurrence d'une zône de territoire français à développer, les départements océaniens de Nouvelle-Calédonie.

Le centre de formation professionnelle rapide de Nouméa venait de lancer une nouvelle section de formation de charpentier de marine pour la construction de bâteau et d'embarcations les plus diverses pour les besoins des cabotages et transports entre les îles et les transbordements de rive à rive des cours d'eau intérieurs. Les élèves à instruire sont des autochtones dans la presque unanimité.

Le moniteur est venu pour six mois à l'I.N.F.P. Il reçut d'abord une formation pédagogique complète dans le métier de charpentier du bâtiment et d'habitation, ayant des rapports avec la profession qu'il aurait à enseigner et passa un mois dans un centre de F.P.A. pour application et utilisation, avec des élèves d'une progression d'exercices établie par l'I.N.F.P.

Après, ce moniteur travailla avec un professeur durant trois mois et demi pour rédiger (textes et dessins) les progressions d'exercices pratiques et de dessin traçage propres à sa spécialité, tenant compte **des caractéristiques et besoins néo-calédoniens** (1). Il fallut tenir compte, en particulier pour établir ces documents des moyens matériels un peu réduits, des outillages simples et encore artisanaux des entreprises du pays. Un effort particulier dut être fait pour tenir compte des "attitudes" des futurs élèves (coutumes, gestes, rythmes, particularisme d'interprétation de représentation graphique des formes extérieures des objets) et des besoins de disposer de photographies ou de maquettes pour illustrer certains dires du moniteur.

Note - Avant de clore ce premier chapitre, comme il a été souvent parlé des stages fondamentaux de formation pédagogique de moniteurs organisés systématiquement par l'I.N.F.P., il est bon d'en donner ici les caractéristiques essentielles (2).

Le stage est ordinairement d'une durée de six semaines.

Il comprend :

- une mise au courant de la méthode d'enseignement adoptée pour les adultes, analytique et active, (c'est-à-dire propre à favoriser

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(1) - des plans de petits bâtiments ont du être recherchés auprès d'architectes spécialistes français pour servir d'ossatures à des travaux d'enseignement

(2) - évidemment sur la forme de la méthode d'enseignement préconisée par la F.P.A.

l'acquisition de tous les gestes et bonnes attitudes pour l'exercice de la profession et à faire comprendre le pourquoi de chaque opération),

- des cours, sur la conception, l'élaboration et l'utilisation d'une progression d'exercice de formation professionnelle destinés à rendre le futur moniteur apte à utiliser rationnellement les documents de cette nature qui lui sont confiés.

Cette façon de procéder permet aussi au moniteur de pouvoir mettre au point des adaptations de détail pour tenir compte d'un manque de matériel, de la nécessité d'intégrer un travail productif, de tenir compte d'une coutume locale ou régionale etc ...

- une étude des problèmes propres à la "leçon", cette dernière constituant le métier même du moniteur et sa tâche quotidienne, savoir :

  - préparation du cours,
  - développement du cours :

    comment - effectuer les démonstrations,
    - s'exprimer verbalement,
    - " par écrit,
    - dessiner et faire un croquis au tableau

  - contrôle des résultats des élèves sous toutes les formes possibles,

- des exercices pédagogiques d'entraînement :

  - leçons par les candidats moniteurs à développer devant le professeur de l'I.N.F.P.

- quelques cercles d'étude sur le rôle éducatif du moniteur sur le plan social.

- la pédagogie de l'enseignement de la sécurité durant la formation professionnelle pour savoir comment préparer le travailleur en F.P.A. non seulement, à veiller au maintien en état des matériels qui lui sont confiés, mais encore à se protéger lui-même et surtout, au delà, à se conduire sans danger dans tous les actes de sa vie de plus en plus moderne et mécanisée.

III - LES REGLES ESSENTIELLES POUR L'EFFICACITE DE LA COLLABORATION AVEC l'A.N.I.F.R.M.O.

- Les exemples illustrant le chapitre précédent montrent que l'A.N.I.F.R.M.O. met volontiers ses services à la disposition des autorités internationales, gouvernementales, privées (entreprises, associations, groupements divers sans distinction d'origine ou de confession). Ces expériences montrent que le succès dépend de l'observation d'un certain nombre de conditions.

- Le processus suivant qui résume ces règles doit être utilisé, complétement ou en partie suivant les cas, par les autorités qui s'orientent vers l'A.N.I.F.R.M.O. pour obtenir son concours technique et pédagogique afin d'arriver à employer dans les meilleurs délais une main-d'oeuvre devant recevoir au préalable une formation professionnelle rapide.

Il faut donc noter :

1) - Missions réciproques en France et dans les pays intéressés qui étudient, sur place, les formes de cultures ou de fabrications ayant besoin de formation de main-d'oeuvre, afin de choisir les progressions d'exercices d'instruction déjà expérimentées en France, à partir desquelles les adaptations pourront être faites.

2) - Stages pédagogiques de techniciens autochtones à organiser en France, pour faire connaître, à ces derniers, les méthodes propres à l'éducation des adultes et permettre l'élaboration des grandes lignes de progressions d'exercices à utiliser dans les pays intéressés.

3) - Création dans les pays intéressés d'un centre de formation professionnelle rapide en même temps que se termine la rédaction des progressions d'exercices d'instruction par les "techniciens-pédagogues" autochtones (celles-ci adaptées aux besoins et fonction des moyens matériels disponibles).

4) - Développement par les "Techniciens pédagogues" des cours de travaux pratiques et technologiques à ceux de leurs concitoyens qui auraient été choisis pour recevoir cette instruction.

Ces stages de formation professionnelle rapide dits "stages pilotes" permettent l'expérimentation. Ils peuvent servir à modifier sur divers détails les progressions types de travaux établis.

Des professeurs de l'I.N.F.P. ayant participé à la formation des "techniciens pédagogues" suivent la réalisation de cette phase comme ils auront dû suivre les travaux de la phase n° 3.

5) - Extension de la F.P.A. :

a) Sélection et formation pédagogique de nouveaux moniteurs autochtones, soit en France, soit sur place, avec l'aide de professeurs de l'I.N.F.P. (au début au moins) et le concours des premiers "techniciens pédagogues" du pays.

b) Création et équipement de centres de F.P.A.

c) Création d'un corps permanent de professeurs de pédagogie professionnelle autochtone recruté progressivement parmi les "techniciens pédagogues de la première heure" et choisis parmi les meilleurs moniteurs de F.P.A.

Par le moyen de cette promotion directe, la relève de l'A.N.I.F.R.M.O., s'assure tandis que se constitue dans le pays en voie de développement, un Institut National de Formation Professionnelle analogue à celui qui existe en France, et parfaitement adapté aux besoins de l'Etat.

Dans la mesure où les premières phases sont menées en profondeur, avec prudence et dans quelques directions essentielles seulement surtout la croissance peut se faire ensuite en "progression géométrique" et vers des pôles les plus divers.

Les bases sur lesquelles l'enquête de départ est à conduire doivent être elles-mêmes très précisées, pour éviter toute dispersion des efforts et toute perte d'un temps précieux. Il faut les situer comme suit pour déterminer les programmes quantitatifs et qualitatifs de formation :

-fixation des objectifs à atteindre, c'est-à-dire former des travailleurs aptes à occuper, dans un délai aussi court que possible, les postes de production essentiels à la vie du pays intéressé, définition des postes de travail ou d'emploi. Ce sont simultanément des postes de manoeuvres spécialisés, ou d'ouvriers spécialisés autour d'éléments préfabriqués d'importation ou de machines d'importation, eux-mêmes répartis autour de postes d'ouvriers professionnels, l'encadrement étant assuré par un personnel mi-autochtones, mi-étranger s'appuyant sur ces ouvriers professionnels pour la traduction des ordres et les exemples et conseils d'emploi de l'outillage.

- détermination des possibilités d'emplois de la main-d'oeuvre en fonction des moyens matériels importés, du noyau d'ouvriers professionnels autochtones et des capacités de formation de l'encadrement autochtone ou importé.

La main-d'oeuvre artisanale existante peut être utilisée pour l'exécution d'éléments ou de sous-ensembles, à moins que son emploi ne soit réservé à la satisfaction des besoins antérieurs.

Si les moyens matériels manquent, il faut en profiter pour lancer la formation rapide d'adultes comme ouvriers professionnels relativement peu nombreux afin de constituer l'ossature du corps ouvrier.

Cette première formation professionnelle de l'ordre de six à neuf mois devra être assurée suivant les progressions mises au point par l'A.N.I.F.R.M.O. ou en collaboration avec elle, à un rythme qui s'accélère dès la fin de la première année suivant un planning lié à celui de l'implantation des moyens matériels.

Dès que les moyens matériels de production se mettent en place, il faut ajouter à ces ouvriers professionnels ou qualifiés des ouvriers spécialisés qui pourront devenir productifs après quelques semaines d'adaptation.

Progressivement, ensuite, sélectionner (1) parmi les ouvriers professionnels les candidats aux fonctions de maîtrise et de cadres et leur faire suivre dans toute la mesure du possible, en dehors du temps de travail, une formation particulière et complémentaire technique en vue du commandement.

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(1) - Bien que ce mémoire ait un autre objectif, il faut signaler que l'A.N.I.F.R.M.O. dispose encore d'un autre service technique important à côté de l'I.N.F.P. Il s'agit du centre d'Etudes et de Recherches Psychotechniques (C.E.R.P.). Cet organisme peut aussi, aider à la mise en place d'un système de formation professionnelle rapide dans un pays en voie de développement. La vocation du C.E.R.P. est la formation de psychotechniciens du travail et l'étude et l'adaptation de tests psychologiques. Comme le choix judicieux des candidats à admettre en formation professionnelle rapide est l'un des éléments de la réussite, le C.E.R.P. peut intégrer l'un de ses collaborateurs dans un programme déterminé de formation professionnelle et l'envoyer sur place procéder avec des spécialistes locaux, à la sélection des postulants à la F.P.A., ou encore former comme sélectionneurs des candidats à cette fonction autochtone.

IV - CONCLUSION

En guise de conclusion à partir de l'expérience faite par l'A.N.I.F.R.M.O. en matière de formation professionnelle rapide pour l'emploi de la main-d'oeuvre, il est possible de dire :

- qu'un pays en voie de développement n'a pas intérêt à vouloir résoudre seul un tel problème,

- qu'un pays industrialisé et équipé du point de vue de la formation professionnelle rapide ne peut résoudre, seul, à distance, "en copiant" rigoureusement ses institutions, les problèmes posés par la formation professionnelle dans un pays en voie de développement,

- et qu'en conséquence c'est par une collaboration étroite que les problèmes posés par la formation professionnelle trouveront leur solution dans les pays en voie de développement.

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Agenda Item: B.2.2.

United Arab Republic

NEW SYSTEMS OF VOCATIONAL TRAINING AND APPRENTICESHIP

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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NEW SYSTEMS OF VOCATIONAL TRAINING AND APPRENTICESHIP

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I. PRIORITIES OF DEVELOPMENT

1. A developing country may be defined as a country whose economy is based primarily on the export of raw materials and whose natural resources are capable of being developed into industries producing commodities or capital goods which would find a place in international economic exchanges.

2. The man-power resources of a developing country may be vast but they have not acquired the skills which enable their earning power to permit a reasonable access to the amenities of a good standard of living.

3. A RAPIDLY developing country is distinguished by an accelerated development of natural resources ahead of the development of its man-power resources and may ultimately suffer a sense of frustration because of the shortage of technicians and skilled workers.

4. The attraction of "rapid development", the pressing political and social needs of an improved standard of living, the absence of planning parallel development of man-power and natural resources can lead a developing country to make a fatal mistake. The mistake of yielding to the attractive propositions of building factories to create jobs, of embarking on large scale projects of land reclamation and processing of natural resources without due consideration to the prerequisite of skilled man-power. The often limited capital available for investment is sponged quickly in the purchase of modern equipment which cannot be utilized with maximum efficiency. Production costs will be high and competition in International markets difficult.

5. The biggest natural resource of almost all developing countries lies not in the hidden treasures of oil, water power, minerals, good soil or any other form of potential, for all such potentials remain useless unless mixed with the super-ingredient of human skill. The greatest resource of most of the developing countries is their man-power resource and it should receive first priority in development. In the United Arab Republic, the labour force is almost 6½ million and if, through training, the income is raised from the present

guaranteed minimum of L.E. 0.250 daily to L.E. 0.500 which is earned at present by a semi-skilled worker, the increase in national income will amount to L.E. 1,625,000. - daily, or L.E. 487.5 million yearly which is half of the national budget.

II. A POLICY AND A TARGET

6. In drawing up a policy for training the man-power resources of a developing country, it must be realized that skills are inherently linked to TRADES, and since in our age of Technology trades subdivide and multiply and transform in the working life of a man, certain skills will become irrelevant and possibly unwanted. The training scheme should allow for a man to enter a new trade. This will not be only a future safeguard for the labour force of a nation but also a safeguard against a rush on certain trades which may appear at the time as paying the highest wages. To cite one example from the experience of the United Arab Republic; the building trade was flourishing at the time when training centers and schools were being established some seven years ago. All personnel engaged in the building trades enjoyed high wages and were in great demand. There was corresponding influx of people requesting and obtaining training as skilled masons, reinforced concrete casters, plumbers, carpenters ... etc. Three years ago, the national planning board saw fit to restrict the investment in buildings and naturally the demand for the skills involved in the building trade became less and that was followed by lower wages which may still become lower if it were not possible for some of those trained in the various building trades to re-enter a training center or a school.

7. A valuable experience of the UAR has been the confirmation of a policy that almost everything from atomic energy to practical skills are better taught in institutions whose sole purpose is teaching, and which are equipped accordingly, provided that qualified teachers are available and the theoretical and practical instruction is tailored specifically for the given objective.

8. A developing country should have as a main policy the creation of a national vocational training system, which, in the absence of a huge industry that can undertake the training of apprentices, may throw the burden on the vocational Education department. The creation of a special ministry of vocational Education for co-ordinating the work between the Ministries of Planning, Industry, Labour, Social Affairs and Education does not seem to be an undesirable overload of the administration.

9. The expansion of a Vocational Education system must be preceded by making available sufficient instructors and teachers. One of the earliest efforts in this direction in the UAR was the establishment of the only Institute of its kind in the Middle East for training instructors and teachers for the Technical Education Department. That was in 1955 and now for more than 3 years a steady stream of 100 fully qualified men a year who have gone through a 5 year course after their full secondary general education, enrich the staff of the Industrial schools and Training centers.

10. The target of the National Vocational Training should be to match the requirement of the nation. Allowing for a working life span of 40 years, the yearly replacement per one million of the labour force is 25000; again allowing for the increase in population and the fact that the training takes 4 to 5 years, it is easy to see that per one million of the labour force the number of young people under training at any given time should be in the neighbourhood of 125000 to 150000. For a country like the UAR with 6½ million labour force, our vocational education system should be able to cope with one million young people. The realisation of such a target explains the difficulties of a developing nation..

III. THE IMPLICATIONS

11. The early drive by the Vocational Education Department of the Ministry of Education, the vocation and apprenticeship department of the Ministry of Industry and the coordinated efforts of the Ministry of Labour and Social Affairs was to reach a decision that a given percentage of the capital to be invested in the five year industrial plans should be set aside for training the human resources.

12. The Ambitions figure of 10 percent was considered too high by the Planning Committee but the argument put forward, that to devote 10 percent of the capital to be invested for the purposes of training would ultimately double the output, was never refuted.

13. A developing country cannot exert all its energy in one direction of development. That is to say a country cannot concentrate for example on the field of education only or on economic development alone but rather the effort must be spread and a certain bias given to the field of priority.

14. The implications in the case of the United Arab Republic were first of all the allocation of the necessary funds and the insistence that without the development of the skills of the enormous labour force, the set back that would be suffered in later years of development would have a detrimental effect on the nation both physically and morally.

15. The training plan implied also that the agricultural workers must be included otherwise the bulk of the labour force would be left outside the scheme. It was also realised that training agricultural workers on new systems and methods was in some cases more difficult than training potential industrial workers.

16. But above all the most serious implication was that the mental attitude towards manual work of the bulk of a population which has grown to consider a white collar job as the ultimate in achievements, must undergo a radical change.

IV. THE METHODS ADOPTED

17. The inducement of craftsmanship, even agricultural craftsmanship, can be attained more in a school or college than in the industrial plant or the fields. It was decdided that a fair standard of general education forms an excellent background for any vocation and the accent was on the young people who had completed 9 years of general education. This was set as a first step towards a later requirement of 12 years of general education.

18. In a developing country where the young people are not likely to come in close contact with modern industrial equipment and modern farm machinery, close attention must be given to the practical training without losing sight of sufficient instruction in the theoretical side and also of adding to the general education of the student. In the UAR we had to think also of the efficiency of utilisation of expensive equipment. We could not equip schools with L.E. 100000 - worth of equipment and use it a few hours in a few days a week.

19. Thus one of the methods adopted was to establish Industrial schools for boys and girls who had completed 9 years of general education. The curricula of such schools was designed to allow 50% of the time in workshops, 25% for theoretical understanding and Technology and 25% for general education. The 50 percent practical instruction although considered a minimum allowed the full utilisation of the shops throughout the whole day. In recent years the schools were opened for two shifts of the students from 8 A.M. to 9 P.M.

20. In the vocational agricultural schools similar methods were adopted and each school annexed a farm of not less than 80 acres (about 20 Hectares) where the students carried intensive training and use of modern equipment.

21. For the sake of comparison it may be useful to mention that the cost of a school fully equipped for a three year course of 1000 students was approximately £ 200000.

22. It was fortunate that the UAR planned and carried out with vigour this long range program. The number of vocational schools rose from 23 in 1952 to 180 in 1962 and the number of students from 18000 to 100000 and the sums invested and allocated for investment until the end of the five year plan in 1956 was established and approved at £ 24 million. The cost of training per student is between £ 60 and £ 65 against £ 20 for secondary general education.

23. The growth of the schools was necessarily slow and the growing industry was impatient. Thus the Ministry of Industry carried out a parallel program of accelerated training as well as a long range program of normal industrial apprenticeship. The investment was some £ 11.5 million.

24. It is true that the combined investment of £35.5 million was short of the desirable percentage of the total invested capital in the industrial growth. But it was realised that not all the difficulties came from the shortage of funds.

25. Vocational education and training covers all sectors of the economy, such as agriculture including animal husbandry and land reclamation; small scale and cottage industries; large scale industries such as iron and steel or metal industries; and home economics.

26. It is for all types of workers, including specialists, semi-skilled, skilled, supervisory, technical, commercial and managerial.

27. The Vocational schools and institutes serve different sectors of the economy, and also serve the different individual requirements by providing workshop experience and theoretical instruction as in-service training, up grading courses. These services are rendered by organising full-time day courses and part-time evening classes.

28. Pre-vocational activities are used to a small extent in post-primary (6 years) and post-preparatory (9 years) education. The courses have a little bias of not more than 15 percent towards practical activities.

29. The Pre-vocational activity has not received full attention in the UAR but should be seriously considered by developing countries. In industrialised countries such activity may not be neccessary, for the very reasons why it is desirable in developing countries. In rural areas it fits the pupils to give their parents profitable help during their vacations (in many developing countries, children became contributory members of the family at an early age). The elementary skills also serve as an introduction into fundamental skills necessary for future work in Industry.

30. Although the young industry in a developing country cannot undertake a major share in training for future and existing needs, its potential however small must not be neglected. The Ministry of Industry in the UAR encouraged employers who do not provide training to incorporate into their shops a systematic and organised form of training. For small employers of the same basic trade, group training centers were created under the supervision of the Ministry. It was realised also that a proper and systematic form of apprenticeship is necessary and a formal law to regulate an indentured apprenticeship system was passed.

31. But as the shortage of skilled workers is becoming more acute and more painful to the expanding industry, the duration of apprentice training has not been made sufficiently long to produce the true skilled worker. The planning committee in a developing country should realise that to produce a skilled technician in many of the present technological trades takes a minimum of FIVE years of intensive training, partly on the job and partly in the class room.

32. The introduction of an accelerated training system should be done cautiously in a developing country. Accelerated training was practiced on a large scale during World War II by the INDUSTRIAL NATIONS , and its purpose was entirely different from the purpose of its application now. In the UAR this is being

done on a limited scale but the tendency of the Ministry of Industry is to increase the activity in that direction.

V. THE DIFFICULTIES

33. To channel a greater number of students who have completed 9 years of general education to the industrial schools was the first hurdle in the course of the Ministry of Education. Almost all parents wanted their children to follow an education leading to a University degree, any degree, irrespective of abilities and aptitudes. Prior to 1954 Vocational education was a terminating stage and parents and off-springs alike shied from the blind alley.

34. The device employed for channelling the urgently needed young craftsmen and technicians was simple. The University doors were opened through an entrance examination to the students completing their courses successfully in vocational schools. The new industrial schools hum with great activity and are unable to accommodate all applications. The advantages of vocational education were obvious; for whereas a boy leaving secondary general education has no alternative but to go to a higher education institute or university, the boy leaving secondary vocational education can, according to his wish either accept any one of a number of jobs or proceed to higher education or perhaps indulge in both activities.

35. The second difficulty was the instructor. The shortage was acute and even those available were being attracted by higher wages in industry. Despite the creation of a special institute, there was the time factor. It takes 5 years to train an instructor and then it was not certain that he would stay.

36. A third difficulty was the almost complete absence of technical books in Arabic. True a foreign language was part of the curricula of the schools but it was imperative to teach the technical subjects and give workshop and field instructors in Arabic.

37. A fourth difficulty was that a master plan for economic and industrial development was not available early in 1954. An extensive training scheme of a developing nation must be flexibly but firmly coupled to its economic development. It was easy to say that 10000 men are needed in the metal industries, but in what specializations? It is depressing for a young man to find, after intensive and hopeful training that he has been trained in a profession which had no prospect of employment.

38. The greatest difficulty, however, was in creating a whole new class of TECHNICIANS and SUPERVISORS OR FOREMEN who did not exist at all.

39. The absence of this link in the chain of industrial production caused and is still causing great waste in the employment of Engineers and Science graduates.

40. Supervisors and foremen are selected from skilled workers for further training in foremanship. Although training courses

are short (6 months), the maturity in his human relations of the foreman is not achieved in such a short time.

41. An Institute for training supervisors and foremen was established in Cairo but still the accent of the training was on modern production methods and equipment. In addition to his technical ability, however, a supervisor should be able to understand the problems encountered by the workers in the performance of their jobs. Developing nations must learn to be patient in evolving this class.

42. The technicians problem was tackled in the UAR by establishing a Polytechnic (it will go in operation in October 1963) which will handle some 4000 students in 50 trades and will have an instructor body of 500. The cost of the Polytechnic is approximately £ 1.5 million.

43. A further difficulty which will meet all developing countries in due course is the output from its general education system whether that be at the end of the school leaving age or at the pre-university level. As the educational system in any country including the industrial nations cannot be designed to lead all children to a university degree or even a diploma from a post-secondary school, the standing wave at the doors of Universities and Higher Institutes will increase in intensity and some form of by-pass into the labour market must be made available for the young men and women at the end of their secondary education.

44. If vocational instruction has been included in their curricula, the problem may not be acute. In most developing countries the odds are that no vocational instruction is given and possibly no vocational guidance is available. At least this was the case in the UAR up to 1955 when a training center was opened for the young people who, having completed 12 years of general education, could not for some reason or other proceed to higher education.

45. The training center provided concentrated courses of 42 hour weeks for ten months in such trades as Electric Welding, Air conditioning and refrigerator service, storekeepers, laboratory attendant, chemical plant operators, motor mechanics, secretarial work ... etc. The overwhelming popularity of those centers made their population grow from 250 students in 1955 to 5000 in 1962.

VI. A I D

46. It is heart warming on an international scale to find that in recent years, many of the more materially developed countries have tried to add their assistance to the local effort.

47. The Specialized Agencies of the United Nations have played an importnat role in making this aid effective through a coordinating and an administrative machine which has no parallel in any single nation.

48. The Specialized Agencies have realized that the pace of development is not yet sufficient to meet the new hopes of

developing nations and their anxiety lest such disappointment might became a real moral breakdown , is obvious in their greatly intensified activities.

49. The Specialized Agencies of the United Nations have come to the aid of the UAR in the field of technical education and Industrial training in supplying much needed experts for the designing of the curricula, for running model schools, for advice on type of equipment and the recommendation of scholarships, both in the Industrial and Agricultural fields.

50. The problem of text books for technical education was also handled by UNESCO through the arrangement of copy-rights and the creation of translation center in Cairo.

51. The UAR has benefited also from some bilateral agreements of training the instructors on a truly substantial scale. Many scholarships have been offered and finally a scheme of "Training through employment" has been put in operation with the objective of training 2000 men a year for a period of 3 to 4 years.

VII. EVALUATION

52. The program of vocational training and apprenticeship upon which the UAR has embarked and is trying to complete is only 8 years old. Its evaluation at this stage with the purpose of criticism may be a little at close quarters but it is excellent procedure to examine from time to time what stages of the objectives have been reached and whether a change in the methods would lead to greater efficiency.

53. In the eight years we have discovered that the time factor is the greatest handicap. It takes years to form a technician or craftsman and even more years for him to mature. It is true we have the privilege of benefiting from the experience of the more developed nations, but it is not always possible to copy. In fact one must not copy but rather try to understand what makes a given system successful in a given country.

54. Co-ordinated international aid through the Agencies of the United Nations may try the patience of developing nations, but having started, the inertia of the immense machine brings forth quicker results.

55. In the UAR, the interim evaluation reports show that, the faster development requires even greater numbers than previously anticipated. They show also that a base of general education as wide as possible should be aimed at for future craftsmen and technicians, that the population is becoming work conscious and the appeal of technical education is spreading at all levels. It is considered that in a few years, it will be time for industry to step in and undertake the greater part of the training. The training of agricultural workers will have to stay perhaps for a while longer in farms attached to Agricultural Schools Agricultural Institute and Universities.

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Canada

SCIENCE AND POPULATION TRENDS

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SCIENCE AND POPULATION TRENDS

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Technology and the Death Rate

1. The effect of science on the death rate is best approached through separate causes of death. The ambiguity of the notion of cause in vital statistics can be resolved for the present purpose by classifying deaths according to the several enemies which kill him. We take up successively bacteria, other organic beings, other natural elements, human enemies of man, and man himself.

2. Bacteria have always been man's principal enemy. History is marked by plagues and epidemics aside from these sudden flare-ups a continuous loss of life, through infection and disease, especially of children, has been taken for granted in all past ages. It was the 19th century that brought bacteria under control, starting with Jenner's invention of vaccination against smallpox, continuing through Semmelweiss's defeat of puerperal fever with chlorinated water, and Pasteur's theoretical discoveries in the 1870's. (2) Contagious diseases affecting children dropped by 87 per cent in England and Wales during the century ending in 1947, and other countries with good statistics showed similar results. What mortality remained was attacked in the 1940's with anti-biotics, and puerperal fever and tuberculosis eliminated in a fresh offensive. Canadian statistics of deaths of women in childbirth show the striking effect of anti-biotics on deaths in childbirth. In 1930-32 there was about one maternal death per 200 live births; in 1940-42 about one in 250 births; in 1959 about one in 2000 births. (3) Aside from inoculation and anti-biotics, bacteria were dealt with through urban sanitation. The individual wells by which city people secured their water were replaced by municipal systems in which filtration and the use of chlorine brought the bacterial content of drinking water down to safe proportions, a result achieved in most parts of western Europe and North America by about 1900.

3. During the pre-historic life of the human race, the contest of men with other animals was undoubtedly a substantial cause of mortality. Even during historic times in Asia and Europe

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(2) Causes et conséquences de l'évolution démographique. Nations Unies, New York, page 66 (1953).

(3) Canada Year Book, page 225 (1961).

accounts of marauding beasts are common, but the total of deaths they caused was small. Much more important were insects and rats which brought various diseases, including bubonic plague. For the most part these were dealt with by attack on the bacteria carried by the animal, but in the instance of malaria technology was used to attack the carrier. DDT was invented about 1940 and applied soon after to the mosquito, with striking results. In 1940 Ceylon had 20.6 deaths per thousand of population; in 1946 she had 20.3; in 1947 the figure dropped to 14.3; in 1948 to 13.2. So rapidly is the practice of house-spraying being extended, and so effective is it proving, that the world-wide eradication of malaria is close at hand. Next to the mortality directly brought by disease-carrying animals and insects, the competition of rats and other animals for man's food - both in storage and in the fields - is one part of the cause of famines where these still occur. The Asian landscape is alive with wild pigs, birds of prey, pariah dogs, all in some degree in competition with man.

4. But starvation, both direct and through malnutrition, is part of man's contest with the parsimony of nature rather than of his struggle with animal enemies and competitors. As Malthus saw so clearly, food shortages limit human and all other populations, affecting man differently in hunting, nomadic and agricultural societies. All means of securing food involve an aleatory element, originating in the complex factors which determine the size of animal populations for hunting peoples, and in the weather for agricultural ones. Men have constantly striven to make their cultivation practices proof against the random changes of weather, the outstanding instance being the storing of water for irrigation of rice and other crops, on which about half the world is dependent today. But there was no means by which food supplies could be ensured in each locality. As recently as 1943, Bengal had one of the severest famines of its history which could not be relieved with rice from Burma because of the Japanese occupation of that country. The establishment of wider and wider transport networks has eliminated local famines, an example being the construction of railways in India starting in the 19th century. Today the question raised is the growth of populations of countries and of regions to the point where for economic or political reasons they cannot get sustenance from the surplus areas of the world. Java, with 65,000,000 people, is rapidly outdistancing not only its own food but all the economic and political means by which it might buy or otherwise command food grown elsewhere. The question of a global food shortage will arise at the level of 10 or 12 billions of people if present agricultural techniques do not change radically - it is suggested below that the time of crisis is about 80 years away.

5. Man has appeared as an enemy of man in all ages. Murder and assassination occur everywhere; even in a country where civil order is exemplary like Canada, there were 178 known murders in 1959. The rate in Ceylon is several times this. To the number of murders would presumably be added the number of persons who suffer the death penalty in consequence - the two being in the same class for our purpose if not for the law. In addition motor vehicle accidents are substantial in all civilized countries; Canada had 3,687 in 1959, (4)

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(4) Canada Year Book, page 220 (1961).

or about one for every five thousand population. But the highest murder and accident rates are small compared with the losses of life in war. In World War I the dead are estimated at 9,700,000, in World War II at 54,800,000. (5) Can we say of the deaths in this category, as of those in each of the preceding categories, that there is a long-term decline? We can say no such thing. Quincy Wright counts 278 wars during the period 1480 to 1941 of which about half were in the first period, half in the second. (6) Using statistics for the period 1820-1949, Richardson also finds no trend in the frequency of wars. (7) Since the magnitude of wars has been increasing this makes it probable that deaths also have been increasing; at best they have been constant. What little advance in peacefulness may have occurred has been more than offset by the acceleration in military technology. The calculation of the trend in war-caused mortality will show differences for direct casualties and those due to war-provoked disease - the former at least constant, perhaps increasing, the latter certainly diminishing. Wars are not confined to any one group of countries; the "peace-loving nations" which constitute the membership of the United Nations engage in war as much as any other group. In Wright's count Britain leads with 78 wars, France is next with 71, Spain next with 64. It is plain that the number and bellicosity of the countries near a country will be important factors in its involvement in war, but no rules can be formulated. The only point that is required for the present purpose is that the application of nuclear science to war could offset every benefit of science to health obtained in all previous times.

6. Men also take their own lives. The surprising constancy of suicides from year to year and from one civilized country to another, at a level somewhat under one suicide per ten thousand population, is the gross fact to be observed. The Canadian figures were 1,271 in 1958 and 1,287 in 1959 (8); these are under-estimates in the degree in which survivors of the deceased are able to hide the fact of suicide. But within the relative constancy of the averages are to be found variations of clear social import. Durkheim, (9) writing over half a century ago, showed higher rates for bachelors than for married men, for Protestant countries and regions than for Catholic.

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(5) Petersen, William., Population, The Macmillan Co., New York, page 585 (1961).

(6) Wright, Quincy., A Study of War, University of Chicago Press, Chicago, I, Appendix XX, page 636 (1942).

(7) Richardson, L.F., Statistics of Deadly Quarrels. Quadrangle Books, Chicago (1960).

(8) Canada Year Book (1961).

(9) Durkheim, Emile., Le suicide, Presses Universitaires de France.

7. Aside from attacks on man by himself or by external human, animal, or bacterial enemies, there are the deaths which result from the wearing out of his body. People are saved from bacteria to be carried away by cancer or heart trouble. Because of this the advances of the past few years have very little affected mortality above age 70; projecting trends into the future suggests a pattern whereby we would all live to our seventies and most of us die in that decade, with a few left over to die in their eighties and nineties. The centenarian population can be expected to increase relatively slowly. However, the protection of the body against its own inherent degeneration is becoming the main emphasis of medical research, and this research may be as successful as the attack on disease was in an earlier day. The two major unknowns are starvation, which is likely to increase, and which tends particularly to affect young children, and war which in its most modern form affects all ages equally.

8. The net effect to date of the various kinds of change described above may be measured in various ways, one of which is the comparison of the expectation of life at birth. One supposes that in most parts of the world, in most periods of history prior to about 1800, the expectation at birth was between 25 and 40 years. But with the application of science, particularly to the control of bacteria in any area, a steady increase has appeared. In Canada the first Life Tables, calculated for the deaths of 1930-32, showed an expectation of 60 years for men; that for 1956, two and a half decades later, shows 67.5 years. (10) The improvement, of exactly 3 years per decade, is about what is shown by a UN calculation (11) for the composite of 15 countries between 1900 and 1950, from 49.6 years to 66.0. For women, both in Canada and elsewhere, the decennial increase rose to 4 years in the 1940's and 1950's.

9. These results are nearly universal, with the countries of Asia, Africa and Latin America rapidly catching up to those of the west. Whereas not many years ago the death rates of isolated parts of the world were as high as 30 per thousand, now a list of 25 countries shows for 1959 none outside of the range 7 to 13 per thousand. (12) In many of these countries registration is no doubt incomplete, for places that are backward in sanitation are also likely to be backward in statistics, and one would need to make adjustments for more precise calculation. The United Nations has done this for continents (13) and estimates for Asia a death rate of 33 per thousand in 1950. But its medium projection for the future shows this as falling to 27 for 1960 and to 20 for 1975. Latin America is shown as 12 per thousand in 1975, and though Africa is still high at 29 per thousand it presumably will fall fast thereafter.

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(10) Canada Year Book, page 234 (1961).

(11) Schemas de variation de la mortalité selon l'age et le sexe, Nations Unies, New York, page 27 (1956).

(12) Canada Year Book, page 235 (1961).

(13) Accroissement de la population mondiale dans l'avenir, Nations Unies, New York, page 35 (1958).

10. How is the fall related to wealth or poverty between and within countries? Alfred Sauvy has studied rich and poor districts of Paris, and found that the poor areas had 43 per cent higher mortality than the rich in 1936, but that in 1946 they were only 26 per cent higher. (14) Specific occupations taken at working ages show larger differentials; Petersen cites data from Moriyama and Guralnick which indicates that the age-adjusted mortality of labourers in the United States in 1950 was double that of professionals for men 20-64. Negro mortality in the U.S. at most ages has been about double that of whites. (15) But on the whole social inequality in the face of death, on which many writers have commented, is tending to disappear within countries as well as among countries. Within a country such as France, or a city such as Paris, the convergence of the trends of mortality goes along with a convergence of effective income, including the benefits of Social Security. As between countries per capita income is by no means coming together; the countries of the ECAFE area are growing less rapidly than those of Western Europe. (16) Holland's per capita annual rate or increase of income during the 1950's was about 3.5 per cent against Indonesia's of 1.6 per cent; that of the United Kingdom was about 1.5 per cent against India's 1.1 per cent, and Pakistan's 0.4 per cent, if we compare metropolitan countries and their former colonies. What social security is being transferred among countries in the form of foreign aid and technical assistance, far from equalizing their levels of income does not even equalize their growth rates.

11. The sharpest differentiation must be made, between the application of science to producing wealth in general, and its use towards the lowering of the death rate. The latter seems to depend very little on the former. Whatever the relation may have been in the industrial revolution the underdeveloped countries of today do not need to wait until they are rich and well-educated to cut their death rate. It would be wrong to say that the fall occurs without effort, for both local elites in those countries and the several arms of the United Nations have been energetic agents of change, but as far as the mass of people is concerned the fall in deaths is going ahead with apparent inevitability. To predict a fall in the death rate down to approximately western standards, it is not necessary to assume any other element of development. But it is to be stressed that this fact applies nearly exclusively to deaths from disease; it is only the victory over bacteria that science brings to the underdeveloped world; the trends for starvation and war are another matter.

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(14) Sauvy, Alfred., op. cit., II, page 81.

(15) Petersen, William., op. cit., page 267.

(16) Economic Survey of Asia and the Far East, 1961, United Nations, New York, pages 11 and 12 (1962).

The Trend of Births

12. During most of human history birth rates and death rates have been on the average nearly identical. Suppose that births were exactly 40.0 per thousand throughout history; if deaths were 39.9 per thousand the population would have doubled every 7,000 years, and since just over 30 doublings will bring a single couple to the three billion people who now inhabit the planet, today's world population would issue from a single couple in about 200,000 years, which is considerably less than the time that was available for the purpose. We need not here consider the ups and downs which in fact existed, and which would require modification of the above result. One could find evidence that the virtual identity of birth and death rates is more than a matter of averages, that the historical periods of high births tended to be those of high deaths; births have often risen in wartime, for example. Investigating further, one might well find that a cross-section of the peoples of the world at any given moment would show a tendency for those of high birth rates to be also those of high death rates.

13. If this could be assumed, and something of a leap in logic permitted, one might go on to say that it is the death rate which determines the birth rate. One might cite instances in which parents whose children died "replaced" them; one might use as an argument the trends in Western Europe during the past century, in which the fall in the death rate preceded the fall in the birth rate, figures for which are cited below. This is somewhat the opposite of the Malthusian view that the productivity of the soil controls total population and that it is an excess of births which leads to an excess of deaths. The two points to be made are that the control of births by deaths, actual and prospective, is not inconceivable, and that the condition described below of the large excess of births over deaths is quite exceptional in the world's affairs.

14. It is not clear at what level the down trend in birth rates started. The physiological maximum of human reproduction could only be determined by experiments which are not likely to be carried out. In all societies there is probably some restriction of births - celibacy, delayed marriage, restraint, even primitive forms of contraception. (17) The highest levels of fertility are probably not attained under conditions of promiscuity (18) nor of extreme poverty. Sauvy (19) considers that natural fertility might well be approximated by the figure of 60.1 per thousand which was shown for the Province of Quebec in 1830-40; by 1850-60 the rate had fallen to 45.1, and by 1959 to 28.5. For the United States we are given figures of the average number of children born per woman whose family is completed. (20) The level is 5.0 for the women of child-

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(17) Himes, Norman E., Medical History of Contraception, Baltimore (1936).

(18) Sauvy, Alfred., op. cit., II, page 103.

(19) Ibid., page 110.

(20) Grabill, Wilson H., Kiser, Clyde V., and Whelpton, Pascal K., The Fertility of American Women, John Wiley & Sons, New York (1958).

bearing period around 1870, drops slightly to 4.3 for the period around 1895, then drops very steeply, apparently levelling off in recent times at about 2.5 children. Similar trends appear in most of the countries of Europe, where the decline set in during the 1870's, except for France and Ireland where it began early in the 19th century. (21)

15. Since in all countries deaths fell before births, there was a period in which population increase was very rapid. England and Wales had 9,000,000 people at its first census in 1801 and 36,000,000 at its tenth in 1901. The United States grew from 5,300,000 in 1800 to 76,100,000 in 1900. Some 60,000 French Canadians in 1763 grew to well over 5,000,000 at the present time. The slowest of these - England and Wales - would enable a single couple to people the world to present density in 1500 years. The consequences of so sudden an expansion for the distribution of world population among continents was drastic, as will be shown in Section 3 below. Here we will introduce that subject by contrasting the western countries cited above with India, which in the 1890's was in the normal condition of an underdeveloped country with 45.8 births per thousand and 44.4 deaths. Its deaths fell to 31.2 by the 1930's, while its births remained more or less where they had always been - at 45.2. (22) This separation of the curves of birth and death, the opening of a gap between them, must be what happened at one time in all the presently advanced countries. If India follows their example, with only the difference that deaths fall even more abruptly than they fell in Europe, then it will multiply in an even greater ratio than the western countries did during their period of demographic expansion, i.e. something in the order fivefold.

16. In no western country did the fall of the birth rate take place uniformly for the several statistically recognizable groups. People who were better off, better educated, living in cities, of Protestant religion, in white collar occupations, reduced their families first. Whereas there had been individual variation at all times in family size, it is probable that in most previous and subsequent epochs the difference among social groups was much smaller than it was between say 1900 and 1925. It is likely that the same groups which showed a fall in the death rate were those whose birth rate fell. Statisticians looking at the birth data, without relating them immediately to death figures, in country after country of the western world seemed to see a natural law (i) the birth rate always fell, and (ii) it fell most for the most "advanced" classes. It is only during the last ten or twenty years, with the narrowing and even the reversal of the classical differentials, that the differential birth rate has come to be seen as a purely transitional matter, leading to a new stability in which the various social groups have about the same birth rate. Unfortunately for making the optimistic inference one would like to make about the convergence of the birth rates among countries, the internal convergence has accompanied a convergence of income and radical movement upward in the occupational scale which is not occurring among countries.

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(21) Causes et conséquences de l'évolution démographique, page 81.

(22) Davis, Kingsley, The Population of India and Pakistan, Princeton, page 85 (1951).

17. The principal differential among countries which persists in the west is that between Western Europe, standing well below 20 per thousand, and North America, the USSR, Australia and New Zealand, and the Argentine Republic, which are all between 20 and 30 per thousand. Grouping countries by their birth rates puts Japan with Europe since about 1955. What characterizes the countries of Western Europe and Japan is that they are industrially advanced and short of space. What characterizes the second group - the United States, Canada, the USSR, etc. - is that they are industrially advanced and have a good deal of space. About 500,000,000 people live in countries with a birth rate under 20 per thousand, and an equal number in countries of birth rate between 20 and 30.

18. Continuing with the classification of the countries of the world by their birth rates, we are left with 2,000,000,000 people in countries whose birth rates are over 30 per thousand. These include all of Asia except Japan, all of Latin America except the Argentine and Uruguay, and most of Africa. These countries have barely reached the shoulder of the S-curve of declining births. (23) They do not even, in the cases of Egypt and India for example, show a differential of fertility between city and countryside. Nor, apparently, do their populations respond to small rises in per capita income. Coale and Hoover believe that people reach the "threshhold of decline" when their per capita income rises to about where that of Europe and Japan were at the time when their declines set in; this is probably between five and ten times the per capita income of most of the crowded countries today.

The World's Population Future

19. We now proceed to make use of the data and the argument gathered together above to gain a perspective on the future, treating the world as a unit to begin with, and using United Nations' figures for 1961 which bring its total population to just about 3,000,000,000. The increase at the present time is about 50,000,000 per year or 1 3/4 per cent. (24) If 1 3/4 per cent is somewhat low as an average over the next generation, then 40 years is the longest we would have to wait for a doubling. Just after the turn of the century there will be 6,000,000,000 of mankind, and just after 2040 there will be 12,000,000,000. This is as far as we need carry the projection. We need not go on to the 15 or so doublings that would end with each person having one square foot of the earth's land surface, nor to the 15 or so beyond that which would bring the weight of humans equal to that of the earth itself.

20. Published estimates of the capacity of the earth's surface to provide food and space range from just under the number presently occupying it up to about the 12,000,000,000 we have calculated for 80 years from now. (25) I shall assume that with intensive application of present techniques the twelve billion can

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(23) Coale, A.J. and Hoover, E.M., Population Growth and Economic Development in Low-Income Countries, Princeton, page 16 (1958).

(24) The United Nations shows 1.6 per cent increase for 1960 and 2.0 per cent on the middle projection for 1975.

(25) Causes et conséquences de l'évolution démographique, page 208.

be provided for, and go on to the more interesting matter of how the population would be distributed.

21. Consider the three portions in which the simple classification by birth rates divided the planet, and project these into the future. Assume that the first group, industrialized and densely settled, has a natural increase of about ¼ per cent per year; the second group about 1½ per cent; the third group about 2 per cent. We now apply these rates of increase to the initial figures and see what happens.

	1961		2041	
	Millions	%	Millions	%
I. Largely Europe	500	17	1110	10
II. Largely US and USSR	500	17	1800	15
III. Largely Asia	2000	67	9000	75

The downward shift in the relative population of the first two groups is considerable. It is especially the countries of Europe, the one-time colonial rulers of Asia and Africa, who are now losing their demographic position as well as their political one. Their economic position on the other hand is becoming stronger both absolutely and relatively.

22. But the allocation of world population to the several continents which is thus shaping up is not really new - it is a reversion to an earlier condition. Using Willcox's data for 1800 (26) and confining ourselves to Asia on the one hand and Europe and North America on the other, we find that the population of the former was three times that of the latter in 1800; 2.5 times in 1850; 1.7 times in 1900; about 1.7 in 1950. The ratio is little different on Carr-Saunders' estimates. Continuing these figures with the UN middle projections (27) which are more precise than the rough estimates of the preceding paragraph, we have the following figures:

	Asia	Europe plus North America	Ratio of Asia to Europe + North America
	Millions		
Willcox			
1800	595	199	3.0
1850	656	300	2.2
1900	857	504	1.7
U.N. actual			
1950	1272	760	1.7
U.N. projection			
2000	3870	1259	3.1

(26) Quoted in Causes et conséquences de l'évolution démographique, page 11.

(27) Accroissement de la population mondiale dans l'avenir, page 26.

The ratio of Asia to Europe and North America together is 3.1, which is almost identical with what it was 200 years earlier. The table is eloquent with the story of the demographic expansion of people of European descent, the subsequent stabilization, and the prospective expansion of Asia.

23. The table tells more than that. The expansion of Asia is three-fold during the half century, against less than 70 per cent for Europe in any equal period. This drastic increase in Asia must be put into relation to economic growth, for which we must try to disentangle two quite opposite views of the relation of population to development.

Population, Economic Growth, and War

24. The first is that of Adam Smith, Durkheim, and Colin Clark. Smith believed that the division of labour was responsible for, and indeed virtually constituted, development, and in a famous proposition he related the division of labour to the size of the market. The relation of the size of the market to population volume and density is a complicated matter and this is not the place to study it. Durkheim (De la Division du Travail Social, PUF, 1960) came at the problem in different fashion, arguing that the pressure of population in a limited space, if people are effectively in human or moral contact with one another, forces the individual members to differentiate themselves. As did Darwin in relation to the animal world, Durkheim believed that competition is most intense between like individuals or species, and the way for an individual to moderate the intensity of competition which he faces is to differentiate himself, to find a niche. The result of moral pressures and incentives where the volume and density of society are great is not only the economic division of labour, but the whole process by which individual personalities are intensified, professional and other associations multiply and individual ambition expands without limit. To these arguments of a sociological character may be added the economic case made, for example, by Colin Clark. (28).

25. What is to this school a cause, or at least a partial stimulus, of the industrial revolution, is looked on by others, in application to present-day Asia, as the chief block to development. As a result of the extraneous discoveries of western science, neither cause nor result of Asia's industrialization, the death rate is declining rapidly. The 1961 ECAFE report, commenting on the fact that recent censuses have revealed considerably more population than had been anticipated, explains that plans have "to be revised to take account of the needs created by bigger annual increase of population in regard to imports, transport requirement, power supplies, schools and other social expenditures." (29) India's annual growth rate, for example, is not 1.3 per cent per year as had been thought, but 2.0 per cent. The per capita nutritional levels for ECAFE countries, which "had already appeared distressingly low," are now seen to have been over-estimates. A more sophisticated argument is that of the need for capital. If it takes 3 dollars to equip a person so that he can earn 1 dollar of income per year, then the equipping of 2.3

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(28) Coale, A.J. and Hoover, E.M., op. cit., page 240.

(29) Economic Survey of Asia and the Far East, page 119 (1961).

per cent of additional population each year will require 7 per cent of income. This is approximately the average rate of saving in the area, with some countries higher, others lower. Even India by dint of enormous effort has succeeded in raising its rate of saving up to only about 8 per cent. (30) Insofar as the rate of domestic saving is the limiting factor in investment, the equipping of new population at the pre-existing level of technology competes with the new investment that will raise per capita income. A thorough evaluation of this aspect of economic growth is provided by Coale and Hoover.

26. When one further takes account of the diminishing returns to land, which a crowded country will have to face in securing its food and the raw materials for its manufactures, the problem is intensified one further stage. Diminishing returns apply in the securing of each additional ton of rice, whether that rice is raised on newly broken land or is additional yield on land already under cultivation. However, a modifying factor of unknown strength is the use of new agricultural techniques, which can in a certain range at least, though hardly indefinitely, counter the parsimony of nature.

27. We thus have on the one hand the view that dense population generates that division of labour which is associated with the introduction of science into production and so with the industrial revolution, and the opposite view that growing population will sink the whole process. I believe that both are true in different circumstances, and that at a certain density of population in relation to resources comes the point of transition at which population density begins to work against development. However difficult it may be to specify that point exactly, there is no doubt that India and Java have passed it.

28. In any underdeveloped crowded country with a liberal political framework, which sets the raising of per capita income as its primary objective, we can speak of a race between population growth and development. If by the considerable effort which is being made, for example in India, income can for a sufficient period of time rise faster than does population, then the various social consequences of that rise of income will make themselves felt: education, the growth of cities, communication through newspapers and radio, etc. Large numbers of peasants will become urban dwellers with urban jobs and ambitions, and the direct consequences for family limitation which these have everywhere implied. Once there are enough of such new kinds of people, there will not be any further population problem. Responsive as they will be to signals of all kinds, from the suggestions of their friends to those of the price system, they will come to have about the number of children that the economic position of the country requires. One will then be able to say that economic development has won the race with population. The reverse situation, in which population growth keeps up with the growth of income so that per capita income barely rises and such saving as occurs is taken up with providing necessary equipment for each year's increment of population, is equally easy to visualize. Here one can say that the race for economic development is being lost, and the positive checks to population of which Malthus warned will come into effect.

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(30) India 1961, Publications Division, Government of India, page 176.

29. But if there is a race of this kind, whose result is so crucial, can one not take the obvious short-cut? Why wait for development to control population through education, changed jobs, the attitudes of urban dwellers? Since only a psychological barrier is involved, people ought to be persuaded directly to use birth control. Calculations have been made showing that paying men to let themselves be sterilized, or couples to control their reproduction, is a more productive investment than steel mills. This policy has in some degree been put into effect in India, but the very slow spread of the new practices shows that the psychological can offer as solid a barrier as the physical.

30. The resistance is particularly solid when the pressure to use birth control comes from outside. Westerners can counsel Asians on the most rational economic grounds, but the advice is received as a kind of obscenity. Very close to the surface of consciousness among nearly all peoples, and proof against most rational argument, is the thought that population is in a mysterious sense a strength and not a weakness. It is fortunate indeed that western governments have restrained their impulses to exercise pressure, for instance by tieing foreign aid to population control; such pressure could only have the effect of strengthening Asians in their suspicion that a power-play was involved and that the west was trying by sophisticated argument to overcome its demographic weakness.

31. Underdeveloped societies are less individualistic than those of Western Europe and America, and they are accordingly less inclined to give up having large numbers of children on the ground that fewer could be looked after better. Aside from possible historic and philosophical reasons which underlie this, there are two reasons of the most grimly practical nature, both of which become congenial in proportion as an authoritarian system is in prospect to frame the development process. In most underdeveloped countries a degree of centralized authority is less repugnant than it is for the majority of people in Western Europe and America.

32. The first of the reasons that would change the relation of population and development from the liberal model referred to above is the ability of the central authority, by threat, ideology, and material inducement, to make people work longer and harder than they would work for wages alone. A country's power-investment optimum population is very much larger if the average working day is twelve hours than if it is six hours. The longer a farmer can get his horse to work the more worthwhile it is to keep it. When the ruler can regard his population as horses he will want to have more of them than if he has to treat them as the difficult and sensitive creatures that men are.

33. The second reason is the danger of war. If a modern war breaks out losses may be very great. Current books on strategy talk cheerfully about death rates of 50 per cent and more in a war lasting a few hours. In the face of such losses, would not one be wise to stock-pile people? Like any other stock, people cost money, but if they are peasants they do not cost as much as urban dwellers, and they are especially cheap if they can be made to work twelve hours a day. If war comes to the country in question, the loss of

50 per cent will bring populations down to what the economic calculations say it ought to have been all along. If it comes to a neighbouring country, then the superfluous 50 per cent can move across the boundary when the radioactivity has died down. If war clears a distant continent, there will be a race to transport the people who will appropriate it. Without having any concrete evidence of the extent to which this notion is disseminated, of how far it reaches down from the elite to the masses, one cannot but note that mainland China appeared to be veering towards a policy of birth control and then changed to encouraging population just at the time when missile-born thermonuclear war became technically feasible.

34. Our age is teaching itself to face the grimmest of possibilities, to think the unthinkable. There is only one further stage beyond growing population in a kind of seed-bed to take up space that may later be cleared by nuclear weapons. That is the deliberate use of such weapons to make space for surplus population, a use which may yet be added to the repertoire of international politics.

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FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

C O R R I G E N D U M

Agenda Item B.1 should read : B.

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UNITED NATIONS CONFERENCE
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FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: B. 2. 1

United Arab Republic

TECHNIQUES OF MANPOWER ASSESSMENT AND THEIR IMPLICATIONS FOR DEVELOPMENTAL PLANS OF THE UAR

By H. M. HUSSEIN, Ph. D.,
Under Secretary
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and M. A. EL-SHAFEI,
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S. M. EL-HAMMAMY,
S. H. BARGHOUT,
T. E. SAFWAT

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

TECHNIQUES OF MANPOWER ASSESSMENT AND THEIR IMPLICATIONS FOR DEVELOPMENTAL PLANS OF THE UAR

H.M. Hussein, Ph.D.

Under Secretary for Statistics Department

In collaboration with :

M.A. El-Shafei; A.M. Shehata; S.M. El-Hammamy;

S.H. Barghout; T.E. Safwat.

PART I

Sources of Data and Methodology

1. The assessment of current manpower resources is today one of the main tools for economic development planning. Since the validity of manpower assessment depends upon the reliability and the accuracy of the available statistics, an enumeration of the major sources and a brief indication of their relative usefulness for this purpose is given here.

Major sources of Data:

2. Population censuses - The changes in definitions, the expense, the effort and the time required for the undertaking of these, as well as the often incomplete information are factors which limit the usefulness of this source. Its chief limitation for our purpose however is the inadequacy of its supply of occupational and industrial information.

3. Statistics related to Industrial and Commercial Establishments - These have the advantage of providing adequate data on occupation and industry by geographical location, the number of workers on payrolls, the hours worked during specific periods, etc. The disadvantages of this source are slight and may be counted as due to: a) the influence of atypical establishments, b) difficulty of computation of standard error, c) double counting of those working in more than one establishment, d) the same weight being given to part-time workers as to full-timers, e) limitation of coverage.

4. Data gathered from Employment Service Offices - Data on job-applicants, available openings, referrals, placements,

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and labour market information are all readily available from this source. Of course the scope of such data depends on the number of such offices and the statistics unfortunately show data of un-employment in greater detail than they do for employment.

5. Compulsory social insurance data - This is of considerable reliability though legislative and administrative regulations affect the data. In the case of statistics related to Relief, they are especially influenced by the coverage factor.

6. Trade union and union benefit fund statistics - Because affected by the degree of development of the individual union and by conditions governing membership in the unions, these are not considered reliable sources of information.

7. Indices of employment measurement - The number of persons employed in the major divisions of economic activity, or indices related to total hours worked (manhours, wage measurements, etc.) are used as measures for the volume of employment.

8. Manpower sample surveys - Data obtained from these afford information on the two major sections of the Labour force, employed and unemployed. They also offer the further advantages of flexibility, inexpensiveness, less effort and time than required for census, while they give an overall picture of the population, with no double counting, yet allowing for cross classification of economic activity and personal and family characteristics.

9. Available data in the UAR - In the UAR all the above sources are tapped in varying degrees with a heavy dependence on the manpower sample survey adopted since 1957. Since the revolution ten years ago, real effort has been made to modernise and organise statistical procedures and data processing in order to keep pace with the changes in the economic structure. A Central Statistical Committee has been established to supervise and help prepare comprehensive up-to-date figures. The National Planning Committee of the Presidency of the Republic was also set up for the purpose, amongst others, of developing planning techniques. Those of manpower assessment were given high priority in importance. The Ministry of Labour plays a large part in the protection and maintenance of manpower (employment service offices, manpower surveys, the gathering of information on labour market trends, syndicates, disputes, technical research, etc.) Naturally the Census Bureau remains responsible for census data and other periodic surveys such as Establishment surveys, Production surveys, and other by-products of demographic and vital statistics. The National Organization for Insurance publishes periodic reports in its own field which form valuable additional sources of data for manpower assessment.

10. Among other steps taken to ensure increased reliability and accuracy of Statistical data are:

(a) The introduction and wider use of modern machinery for the processing of Data.

(b) The increase of coverage and periodicity of certain surveys.

(c) The continuous training of investigators and persons employed in the processing and analysis of data.

(d) The establishment in greater number of Employment Service Offices throughout the country.

(e) The institution of an Unemployment Insurance system.

(f) The undertaking of new surveys.

PART II

Manpower Sample Survey (by Households)

11. Definitions: Of the terms in use here are those given in the International Standardization of Labour Statistics of I L O. One exception, however, should be noted: the term household is defined to exclude all institutional population and the armed forces.

12. The Survey: Takes into consideration the following variables:

(a) Geographic distribution of the labour force by sex, age, marital status, education, employment, occupation and industry.

(b) Level of wages (this variable has been added since the 14th, round).

(c) Measurement of seasonal changes in the above variables.

(d) Measurement of the extent of employment and unemployment.

13. Techniques and periodicity of the rounds: The interview method has been adopted. Two hundred and fifty trained investigators filled in the schedules while interviewing the head of each of the 21,000 households of the sample in each of the first four rounds. Gradually and according to modifications introduced into the schedule the investigators were increased to 1200 and the Households to 60,000. The field work of each 4 to 5 investigators is checked by a supervisor. For each province a controller and two assistants are responsible for the organisational and technical problems of the operation within their area. An executive board appointed for the planning, supervision and execution of the survey, controls the overall operation.

14. Sampling design: The Country is divided into nine zones. This stratification brings into the investigation a number of beterogenous groups of the population, each group homogenous internally as far as available information shows. The sample was drawn from a frame derived from the preliminary information recorded by the enumerators at the preparatory stage of the 1957 census.

15. It was assumed that the variation in occupation and industry records its maximum value in both Cairo and Alexandria, while decreasing in the rest of the urban areas to reach its minimum value in the countryside, the sample fractions for each of these categories was consequently different. In the first

two strata (Cairo and Alexandria) a two-stage sampling design was adopted. From each one of the districts (Quism) half the blocks (Shiakha) were selected at random. A number of households proportional to the total number of households in the Shiakha, and equal to 1% of the households within the Quism, was selected systematically from each selected Shiakha. In the third stratum a similar procedure was adopted with the slight difference that only 0.5% of the households were selected. For each of the cities and towns with a population of 5,000 households and over (4th and 7th strata) the same sampling fraction was fixed. For small towns with a population of less than 5,000 households (strata 5 and 8) 0.25% of the households were selected from each province.

16. For the sake of convenience and simplification of the field-work, a three-stage sampling system was adopted for the two zones comprising the rural part of Egypt, i.e. the 6th and 9th strata: first, 1/4 of the districts (Markaz) in each province (Moudiria) were selected at random, then 1/10 of the villages belonging to each selected Markaz were chosen at random. A sample of households was systematically selected from each selected village according to size of the village, bringing the ultimate sampling fraction to 0.25%.

17. Modification introduced in the sampling design: The sampling design was revised in the light of the experience gained and the results obtained after the compilation of the fourth round. For the fifth round the sample design adopted was as follows:

(a) The Country was divided into five strata:

(i) Cairo, (ii) Alexandria, Canal and Suez

(iii) Capitals of provinces and large towns in Lower and Upper Egypt, (iv) Capitals of districts in Lower and Upper Egypt. (v) Villages in Lower and Upper Egypt.

(b) A random sample of 1% of households was selected from the Shiakhas constituting each of the first two strata. A sample of 0.5% was similarly selected from the third stratum.

(c) For the fourth stratum half the towns were directly selected at random. Then 1% of the households was selected from each chosen town thus bringing the sampling fraction to 0.5%.

(d) For the fifth stratum, villages were classified in two types:

(i) Large villages with a population of 2,500 households and over.

(ii) Other villages. One-sixth of the villages of type (i) were selected at random. A sample of household was chosen from each selected village bringing the ultimate sampling fraction to 0.5%. From villages of type (ii) only 5% of the villages of each province were selected at random. A sample of 4% of the households of each selected village was chosen to bring the sampling fraction for this substratum to 0.2%. This substratification leads to more homogeneity within the population groups investigated.

(e) The main characteristics of the population belonging to the villages of type (i) were tested beforehand in order to assess their deviation from both the rest of the rural population and that of small-town communities. The test was intended to indicate the relevant stratum to which big villages belong. However, no definite conclusions could be drawn.

18. Rotation of sample: Starting from the seventh round, a rotating sample design was adopted. Two independent samples of households were selected according to the design used in the fifth round. Each of the two samples was divided into three systematic subsamples thus giving a total of six rotating groups. Three of these sub samples were selected at random and the households in them were interviewed for the seventh round of the survey. From the eighth round one rotation group selected at random, leaves the sample for three consecutive rounds and is replaced by another group. In this way one-third of the usual sample is common in three consecutive rounds, and two-thirds in two consecutive rounds. This system of rotation provides continuity in the series of data and facilitates the measurement of changes in the characteristics studied. It helps to reduce sampling errors.

19. Sampling design for the sequence of rounds beginning April 1961: Here the design was changed again in order to obtain the required estimates for each governorate separately:

(a) Urban governorates (governorates without villages)

(i) The sampling fraction was fixed at 1% for Cairo and Alexandria, and 3% for Suez, Ismailia and Port Said, not exceeding 1400 households in each of the last three governorates.

(ii) One-stage sampling selection was adopted and districts were represented by all their subdistricts.

(iii) The sampling size was distributed among all the subdistricts in proportion to size.

(iv) The number of households chosen from each subdistrict was selected systematically.

(b) Rural governorates (governorates with villages) Each governorate was divided into two strata as follows:

(i) Rural area containing all the villages of the governorate. The sampling size was fixed at 1400 households selected as follows:

(a) The sampling size was distributed among all the markazes in proportion to their size.

(b) In each Markaz 10% of the villages was selected at random. The minimum number of these was fixed at two villages.

(c) The number of households in each Markaz (determined by the first step) was distributed among the selected villages in proportion to their size.

(d) The required number to be chosen from each was selected systematically.

(ii) Urban area containing the capital of the governorate and the capitals of the Markaz's. The sampling size was fixed at 1400 households selected as follows:

(a) The sampling size was distributed among the capitals of the governorate and the capitals of the Markaz's in proportion to their size.

(b) The required number of households chosen from each capital was selected systematically and in a single stage.

PART III

FUTURE SUPPLY

Forecasting the future supply of labour:

20. A knowledge of the expected future supply of labour was needed for drawing up the Socio-Economic Development Plan of 1960-1964. This necessitated the projection of population estimates, total and by sex and age. It was achieved in three steps:

(a) Percentage of labour force to toal population.

(b) Consideration of expected expansion in education.

(c) The increase of females in the labour force.

21. For the projection of the total population, the natural increase occurring in 1953 (last official data available) was assumed to continue. For the age - sex distribution, the actual percentage distribution deduced from data arrived at in the manpower sample surveys undertaken as stated above was applied to the total population projected as described, thus assuming stability of the structure over the period. This assumption was rationalised on two bases:

(a) Stability of the age-sex structure of the UAR population over the past 30 years.

(b) Shortness of the period under study.

22. In order to make allowances for the expected expansion in educational facilities an attempt was made to classify the increase in the labour force according to educational qualifications. Two types of educational stages were distinguished:

(a) Final Stages - (those stages at which a training is considered final) include universities, high institutes, technical institutes and vocational training centers. Graduates of these institutions, males and females during the five year period under study were assumed to be going into the labour market (deaths excluded).

(b) Continuing Stages - (those stages from which it is assumed the student proceeds to a higher stage of education) include all the stages of the public

educational system. All males and a percentage of females (estimated at 10% of the males) leaving school at whatsoever stage of their general education were considered as going into the labour market (estimated deaths are also excluded).

23. The difference between the estimates of the total increase in the labour supply over the five year period studied and the number of young people going into the labour force during that period (the sum of (a) and (b) above) represents the number of people joining the labour force without going through any vocational training institution. The annual increase of females in the labour force was found to be 8% of the total females in the UAR. The difference between this percentage and the 2.5% natural increase for the total population multiplied by the number of females in the labour force in the base year represents the annual addition by which estimates arrived at in step two had to be adjusted.

PART IV

Forecasting of Future Demand

24. A number of methods and techniques were proposed in order to obtain the required estimates but none gave a perfect or completely reliable answer. The first suggestion offered was to depend on employers own estimates of the force they would need during the period under study. Two main difficulties however came up:

(a) Employers estimates in many cases, especially in those industries or technologies new to the country, were mere guesses.

(b) Estimates of labour turnover in existing establishments, especially small ones, were to a great extent, unreliable. Capital to labour ratio was thought of, but difficulty in defining and measuring the type of capital most appropriate made it impractical to depend directly on such a ratio. Size and nature of planned investment was considered, but this was done indirectly through their effect on volume, and structure of production. Changes in the latter were the basis of two main attempts actually undertaken. The ratio of gross production out-put to labour was assessed by economic sectors for the base year. Alternative rates of annual increases ranging from 1% to 5% in labour productivity (measured by the above mentioned ratio) in all sectors were assumed. When total demand under any of these alternatives exceeded forecasted total supply, demands of all sectors other than agriculture were assumed to be fully satisfied first, and the remainder was to be left to agriculture which is known to be already overstaffed.

25. Unification of annual rates of increase in all sectors was criticized as well as the interpretation of over-staffing in agriculture. So another attempt had to be undertaken. Gross value added was then considered a better manifestation of labour productivity than gross production. Gross value added per worker was assessed for each branch (not sector)

of activity in the base year. On the basis of post development and intended levels of productivity and taking into consideration the type of technology that is expected to prevail, annual ratio of increase was set for each branch of activity separately.

26. Manpower requirements assessed in this way were submitted to one more adjustment and to a number of checks. The adjustment took into consideration the indirect effects of investment in one branch upon employment levels in other branches wherever such effects had not been accounted for through changes in the volume of production and value added. The main check was achieved by comparing branch by branch, the total annual wages that would result from forecasted number of employees and expected average annual wages with estimated value added.

27. Estimates of changes in the average annual wages took account of:

(a) Changes in the occupational distribution which were expected to reflect two main trends having opposing effects upon average wages:

(i) Increasing dependence upon skilled and highly trained professionals, technicians and workers receiving above average wages and salaries.

(ii) Increase in employment would naturally occur at the bottom where wages and salaries are usually below the average.

(b) The generally observed secular trend of rising average wages.

(c) The socialist objective calling for the raising of workers share in the returns of economic activities and the raising of their minimum wage rates.

Methods mentioned earlier but considered to be of limited reliability were used as a check on estimates arrived at during this second attempt.

28. The total future needs thus forecasted were broken down by occupations. The first approximation to such a breakdown was the projection of the present pattern of occupational distribution deduced from the first four rounds of the manpower sample survey. Later refinements guided but not limited or restricted by occupational structures in similar industries in coutries at the stage of development towards which we tend, and by a knowledge of the technologies expected to prevail in each branch of activity took account of the absorption capacities of various industrial and agricultural development projects for various levels of skills and proficiencies based on chosen coefficients of manpower requirements.

PART V

A FORWARD LOOK

29. Reliable determination of occupational distribution is delayed due to insufficiency of data and to a lack of uniformity in definitions in use. In an effort to overcome these obstacles the Central Statistical Committee has issued a maunal on job -

classification based upon similar international classifications yet adapted to the circumstances particular to the UAR. Generalisation of the use of this manual is one of the committee's aims and a number of steps have been taken towards its realization. Job definition up to the level of the third digit has been completed.

30. It is planned to assess future needs for various skills and technical specializations, in the various economic activities, upon the basis of well defined job - description. This will enable the formulation of:

(a) Realistic long-term educational training programmes to meet the demand for task forces necessary to each industry.

(b) Proper allocation of human resources enabling maximum utilisation and minimum waste of these valuable assets.

31. The burden of achieving this falls heavily upon two organisations other than the Central Statistical Committee, namely, the Ministry of Labour and the Permanent Committee on Technicians and Working Personnel. The later is undertaking at present a comprehensive survey to assess in classified form the future needs of technicians and skilled workers.

32. The establishment of the Ministry of Labour is in itself a manifestation of the augmenting interest in manpower and labour affairs. Its interest is not confined to assessment of future demands of labour; it is also interested - within the field we are discussing - in supply, and means of balancing the two, and other related subjects. The establishment of a national institute of labour has been suggested by this ministry. It is hoped that problems which hinder more reliable assessment of manpower needs and resources, especially those connected with productivity measurement, determination of various technical coefficients, disguised unemployment, geographical distribution of labour supply and demand, as well as those of international comparisons will be adequately solved with the establishment of the proposed institute.

33. The Mobilisation Office of the Ministry of War, the Ministries of Education, Industry, and National Planning are all attempting within their means, to improve the estimates of future supply and demand of labour. The shortcomings of data and methods in use in manpower assessment are recognised and genuine efforts are being made by all concerned to overcome existing inadequacies.

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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: B. 2. 1

Finland

ASSESSING MANPOWER IN FINLAND

By Terho PULKKINEN, Dr. Pol. Sc.,
Helsinki, Finland

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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Assessing Manpower In Finland.

by
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1. The need for an examination of manpower

The practice of manpower politics and the drawing up of a suitable training plan is impossible without a thorough, long term investigation into the amount of manpower, its application and the degree to which it is applied. It is impossible to keep an adequate check on these things by holding a census every ten years. In Finland where the assessment of manpower has been in operation only since 1958, there is a general lack of manpower statistics and the rate and scope of these special statistics are unsatisfactory.

It is very important to follow closely the amount and structure of manpower in a country like Finland, where the structure of the sources of livelihood, with agriculture and forestry as the predominating sources of production, takes a noticeable part of the manpower, but where industrialisation is rapidly taking place. For climatic reasons, the need for manpower varies periodically in many occupations and this leads to short, irregular terms of employment and a continual movement of manpower.

(a) The changes in the supply of manpower

When assessing manpower in Finland, it must be remembered that changes in the percent of population making up the labour force are more important to the supply of manpower than is generally realised, and the drawing up of a manpower prognosis presupposes a continual checking of the labour force. The changes in the percent of population in the labour force depend on three things:

(i) Because of a continual rise in the standard of living, there is a continual decrease in the percent of the population in the labour force,

particularly in the younger and older age groups, on account of general education and the longer time spent at school and because of the generalising of pension schemes and the lowering of the retirement age.

(ii) The percent of population in the labour force might increase because of an economic boom and because higher wages attract the working part of the population, who do not work regularly.

(iii) The percent of the population in the labour force increases during the summer period with such workers as school children and students, who only work during that period of the year. We can only find out about seasonal changes in the percent of population in the labour force by maintaining a continual check on the amount of manpower.

(b) Seasonal changes in the labour force

Prognoses of the short term demand for labour, which should be drawn up monthly or four times a year, presuppose seasonal changes in the sources of income of the labour force. The seasonal change is particularly noticeable in the agricultural and forestry fields but also in the building industry. The demand for labour in industry and in domestic service is in Finland fairly steady.

In the current assessment of manpower, the factors affecting the seasonal changes in the labour force are of great importance to industrial politics in Finland, because the seasonal change in the demand for labour is a regular yearly occurrence, and, for this reason, the state has a duty to prevent seasonal unemployment by levelling the demand for labour.

(c) Changes in the structure of the labour force

The source of income structure in a rapidly developing society is continually changing because that part of the labour force earning its living from the prime sources of production is continually decreasing while that getting its income from the finer types of employment is correspondingly increasing. The amount of the labour force in farming and forestry has decreased by 2-3% a year. It is probable however that changes according to the state of the economy, and the movement of the labour force in the various occupations does not only depend on the amount of labour which can be freed by the prime industries but also on the amount of labour which can be absorbed by the other industries. Changes in the

structure of the labour force mean generally speaking, a movement of labour away from the unskilled trades to the technical occupations demanding a skilled labour force. The training of the labour force requires that a continual check is kept on the occupational structure of the labour force and its changes.

2. The current labour force survey

In order to get more information concerning manpower, at the suggestion of the I.L.O. a so-called current labour force survey was begun, similar to those carried out in Canada and the U.S.A. This survey has been carried out by the Bureau of Labour Market Research at the Ministry of Communication and Public Works, and its method has been developed by doctor of agriculture and forestry Lauri Heikinheimo. The intention is to get from these statistics as quickly as possible, a rough picture of the state of employment over the country as a whole, and of the grouping of occupations and above all, of the short and long term changes in these things. It includes large scale mapping of some occupational grouping or its part of the labour force.

Chiefly in this survey, a method has been followed, adapted in other countries for a corresponding assessment of manpower, although it has included certain exceptions from these countries.

The subjects of the survey, which have changed every year, have been picked from the population register over 15 years of age. Each case was considered separately. Every male over 15 and every female over 15 in each community formed a separate unit. In each case, the same percentage was involved, in 1958 10,000 were picked, in 1959 - 60 20,000, and since 1961, 30,000 personal units. The last mentioned corresponds to 0.9% of the population over 15 years old. The unit picked is the person.

For reasons of expense, the method of observation is by postal enquiry. Each person gets 6 or 7 questionnaires a year. One reminder is sent to those who do not reply. The percentage of answers has continually been high so that 85% of the forms sent out have been returned.

The form covers the persons' activities over a period of three weeks. The panelling method has been used, so that in 196[illegible], a changing sub-sample

of the people was covered, every other week 7,500(1/4 of the whole sample) and 15,00 (1/2 of the whole sample) every other week. So, on an average 3/4 of the whole sample was examined every calender month. The positive points about the panelling method are firstly, that as the persons interviewed are continually changing, they do not get tired of the enquiry, secondly, that the work resulting from these enquiries is evenly divided throughout the year, and thirdly that the accuracy of the estimates is sound compared to the size of the sub-sample.

From the information gained from the sample, the following estimations of manpower and time spending can be made:

(a) The population over 15 years old can be divided into those belonging to the labour force and those outside it. The labour force is divided into employed and unemployed and both of these into occupation groups.

(b) The labour force's use of time is divided intc groups according to the internal structure of the sample; the labour input (daily) is divided into occupational groups.

The estimates are counted weekly and levelled graphically to lessen the probability of accidental changes, and from these levelled weekly estimates is reckoned the monthly average.

In the results of the current labour force survey mistakes may arise for the following reasons:

(c) The estimate of those of working age and of those fit to work, which are the independent prognoses from the sample, may differ from the right amount. This method used in Finland presupposes a good population census.

(d) The mistakes caused by the failure to answer should be reckoned by a special enquiry. Because of a lack of funds, this test was carried out only in 1958. It did however prove that those who failed to answer did not differ greatly from the sample.

(e) Wrong information systematically given can cause mistakes which are impossible to discover.

(f) Accidéntal mistakes, or those caused by the fact that only a sample and not the whole population is used, can lead to mistakes

in the results, which can be reckoned as an average mistake.

In reckoning the manpower estimates, we have tried to use the method agreed to internationally and used for instance in Canada and the U.S.A. which was published as a recommendation of the conference of labour statisticians organised by the International Labour Office in 1954.

The possibility of the current labour force survey in assessing manpower and its regional use is at present limited. The division of the workers according to occupation is reckoned in 11 manpower districts, to satisfy the needs of the country's four large regions and of the manpower authorities.

The following statistics taken from the current labour force survey results, are the average for the year 1961:

	Persons in thousands
Population 15 years and over	3, 173
Total labour force	2, 171
Employed	2, 145
Agriculture (ISIC 01)	629
Forestry (ISIC 02)	142
Mining, manufacturing electricity etc. (ISIC 1-3, 5)	483
House construction (ISIC 4)	124
Other construction (ISIC 4)	65
Commerce (ISIC 6)	252
Communication (ISIC 7)	132
Services etc. (ISIC 03-04, 8)	317
Industry unknown	1
Unemployed	26

The results of the current labour force survey have been excellent, Although the investigation has not been going on for long, it has already given a great deal of very valuable information about manpower and its behaviour. By using the method of mail enquiry, the costs for the year 1961 were only about 30,000 U.S. $. It is probable that this method of assessing manpower, in spite of its bad points, suits a small country like Finland more than the method of personal interview where the costs are very much higher.

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Agenda Item: B.1

Sweden

NEW DEMOGRAPHIC TECHNIQUE FOR STUDYING DEMOGRAPHIC-ECONOMIC-SOCIAL INTERRELATIONS, INSTRUMENTS FOR PROJECTIONS AND DEVELOPMENT PLANNING

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New demographic technique for studying demographic-economic-social interrelations, instruments for projections and development planning

No. 559

B.1.

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1. Introduction

It is generally agreed that there exists a great variety of relations between the composition and changes in a population and the structure and changes in its economic and social life and cultural conditions. Some of these relations are simple one-way causal relations, such as the influence of poor housing upon health, on working capacity and possibly on mortality. An example of causal influence of population on economic factors is the variation in the composition of demand for different types of goods and services following a variation in the rate of natality.

The majority of relations in which demographic factors occur are, however, complex and may preferably be called demographic interrelations (more completely: demographic-economic-social interrelations). The direct causal influence of different factors is usually unclear. The influence is often two-way or it may operate through a number of other factors. As an example the following may be mentioned. Infant mortality can be expected to decrease when poor housing conditions in an area are improved; but it is probable that the mortality is already falling, in part because of several other factors, which themselves also caused this improvement in housing and building of new homes.

Knowledge of these interrelations can be considered the center of demographic interest and efforts. Penetrating, reliable and pertinent information about them will offer good and necessary instruments for forming a better world, in local work, on governmental level and internationally.

Unfortunately, our present knowledge about demographic interrelations is poor and unsatisfactory even in countries with well-developed statistical systems. The reasons for this are several. One is the complexity of many variables involved in a system of both straightforward relations and multivariate interrelations. Another reason is that, whenever economic factors are involved, monetary and other economic changes usually tend to obscure the effects upon the demographic changes as well as the consequences arising from these latter changes.

Even where reliable, informative and detailed statistics are available and one can estimate certain relations of bivariate and multivariate types, with elimination of the disturbances from specific factors, the knowledge will be far from sa-

tisfactory. The causal relations cannot automatically be assessed by means of traditional statistical analysis. Special methods of analysis and a thorough factual knowledge of the demographic-economic-social conditions therefore become necessary.

The main reason for our unsatisfactory knowledge about demographic-economic--social interrelations lies in the fact that we are concerned with situations and changes of a non-experimental character. Human activities, behavior and relations cannot be studied with an experimental approach.

While experiments mean repeated observations under conditions where only one or a few controlled variables are allowed to vary, it is necessary in non-experimental situations to take such observations of variable-constellations as it is possible to obtain. The interpretation of available statistical data therefore becomes difficult, uncertain and/or systematically biased; sometimes a statistical analysis cannot be undertaken at all as no quantifications are possible.

Several ways and methods have been suggested for revealing the interdependence in non-experimental situations. Thus, for example, great efforts are being made to develop so-called econometric models to represent the main structure of economic life. The idea of "model-building" should in principle be useful in all kinds of social research and seems especially suitable for studies of demographic-economic-social interrelations.

The development of electronic computers makes possible a great step forward. We have now at hand, therefore, the means of developing realistic demographic models. This can be done through the combined use of

(a) logical relations concerning certain demographic functions,

(b) available statistical data for estimating demographic and socio-economic functions and parameters, and

(c) electronic computers for handling the large materials and the numerous alternatives for a number of demographic, economic and social factors.

The original purpose of all model-building is to obtain a schematic but realistic picture of the main factors involved. A new feature in model-building is the possibility of simulation offered by means of Monte-Carlo-methods and in other ways. Through these the models can be made to describe more and more closely the real development of the various factors and functions. The simulation approach seems to be essential for obtaining a good grasp of the demographic-economic--social interrelations.

2. Theoretical discussion of demographic models.

The term demographic model may be used for a variety of sets of functions and relations, both with general and with rather specific aims. The models attempt to express functional and other relationships between demographic factors and between demographic, semi-demographic and other factors (such as purely economic, social and cultural). For a more detailed list of factors see below.

Already the first mortality tables constructed during the later half of the 18th century led to what can be considered demographic models. The later work by Bortkiewicz and especially by Lotka led to fruitful results concerning stable populations. A recent step in this direction is the model-construction carried out by the demographic specialists of the United Nations, whereby stable and semi-stable age distributions have been used as a way of forecasting the world population (The

future growth of world population. ST/SOA/Series A/28. UN 1958).

The above-mentioned models are examples of what may be called macro-models as they are based on the average or aggregate conditions with regard to mortality and fertility of a whole population. As micro-models may be characterized such models where the conditions of the individuals are expressed through the single events occurring to them (deaths, births). The individuals can here be considered as the smallest units, but it is also possible to use households or families, firms and organisations as units in micro-models.

As an example of micro-model mention may be made of the Americal study "Micro-analysis of Socio-economic Systems" by Orcutt, Greenberger, Korbel and Rivlin (New York 1961). In this investigation, a miniature population corresponding to the recent census in the United States was constructed comprising 10 000 individuals. These were then subjected to different vital events by the use of random numbers. This was done with a view to obtaining the same average mortality, nuptiality etc. as that of the real population.

The realism of a demographic model can be evaluated by using it for forecasting from one census or sample survey to another. If the model is correct and the quantification by means of available statistics is acceptable, the forecast and the later census should coincide to a degree corresponding to existing errors. To some extent correction can be made for bias; when using electronic computers this can be done by a system of feed-back.

If the model is based on average or aggregate information pertaining exactly to the actual population and period, there should be no deviations due to randomness but only systematic errors. If these are considered too large, the model has to be revised.

The desirability of having the model show random fluctuations can be met by feeding in random disturbances at some suitable points of the model. This can be done by using random normal deviates. With regard to the character of variations in economic and social factors, it seems more realistic, however, to utilize some kind of non-normal disturbances, e.g. random log-normal deviates.

The main purpose of demographic models is the derivation of instruments for studying the interrelations between population trends and structure, economic factors and social conditions. This goal can be obtained only by a step-by-step procedure, starting with the main demographic factors to obtain stable distributions and then taking in other demographic factors and economic and social factors.

The successive development will give new information about different factors involved and about their variations and covariations. It will also be possible to obtain new and better measures of quantitative and qualitative attributes through standardization for certain structural factors. The validity and effectiveness of ordinary methods of population analysis can be tested by the use of demographic models. Finally, improved methods of population projection and forecast will be obtained.

The factors to be included in demographic models can be divided into purely demographic factors on the one hand and semi-demographic factors and socio-economic factors on the other.

A further classification can be made into change factors and structural factors.

To a certain extent there are fixed functional relations between demographic change factors and demographic structural factors. Thus, for instance, the age distribution of a population is exactly determined by the size of cohorts, the mortality and the migration. Some of these functional relations can be expressed mathematically and therefore only need to be quantified. In other factors the relations are too complex to be derived except through numerical estimation of simple marginal distribution, correlations etc.

The following list gives the customary demographic factors and a list of semi-demographic and socio-economic factors. It should not be necessary to explain these in detail. The names of the different factors should be taken to include all the various aspects and versions pertinent to any kind of demographic-economic-social-cultural situation, real or theoretical.

List of factors for demographic models.

Demographic factors		Semi-demographic and socio-economic factors	
Change	Structural	Change	Structural
Mortality	Sex	Morbidity	Health
Nuptiality	Age	Entrance into and exit from labour force participation	Labour force participation
Divorce	Civil status	Invalidization and revalidization	Working capacity/ /status
Fertility	Duration of marriage	Entrance into and exit from industrial branch	Industry
Migration (geographical)	Number of children per individual and per marriage	Entrance into and exit from profession	Educational status
	Urban/rural place of living	Social mobility	Profession and professional training obtained
		School attendance and professional training	Social status
			Income
			Housing
			Ethnic, religious and racial group

3. Notes about current research on demographic models

The quantifications of demographic and other variables and functions to be fed into the models can be made either by observed data, by modified observed data or by purely fictitious values. One important feature of demographic models is that assumed changes in one single factor can easily be evaluated with regard to other factors. If, for instance, the general mortality is assumed to decrease by various amounts at certain ages, due to a reduction in a specific cause of death, the corresponding changes ceteris paribus in the stable age structure, in

the demand for medical care, in the national income etc. can easily be calculated.

The data used in the different approaches now started at the Demographic Institute in Gothenburg have been selected from

(a) Swedish data for recent and pre-industrial periods

(b) data of a number of other countries, less developed as well as industrialized.

For some factors and functions use has also been made of

(c) theoretical constructions and assumptions.

While the first steps in demographic model-building may well be made with ordinary desk equipment, it soon becomes indispensable to use an electronic computer.

The research on models started at the Demographic Institute in Gothenburg is being done with the aid of a couple of computers available for the research work at the University.

The programs are mainly written in the code ALGOL which will allow them to be used on several makes of computers available in other countries. In order to make the work even more accessible it is planned to make the necessary transformations to present the programs also in FORTRAN.

A few words should be said about the testing of programs by making forecasts and comparing the results with factual observations.

This can in principle be done for populations covered by two or more censuses or sample surveys. In the latter case, however, the sampling errors are often so large that the comparisons become meaningless. The censuses, on the other hand, are usually too few, and undertaken at too long time distances and with varying methods and definitions.

Even in countries with fairly good statistical series, a testing of demographic models through forecast-comparisons must be performed with great care. It is considered that Swedish data from the censuses and the registration of vital events are in certain respects accurate and consistent enough for undertaking such testing. This may be said not only about population statistics of recent decades but also about the immediate pre-industrial period.

For special variables where censuses and vital registration are insufficient, it is possible to test the models through specially obtained data on demographic and other characteristics and events. This can fairly easy be done in areas with registrations similar to those at hand in Sweden. Application of the models to the population and the economic and social conditions of a smaller region will give detailed information of great value both to the research on model-building and to the local planning agencies as well. For this reason, the research undertaken at the Demographic Institute in Gothenburg will be tested by means of data for the Gothenburg Metropolitan area.

The research on demographic models at the Demographic Institute is planned to deal with both general model-building and specific questions. Most of the latter will be of relevance to populations of both less developed areas and industrialized countries. Some, however, will be of particular interest for those po-

pulations which are now in the earlier stages of demographic transition.

Below are given a number of specific problems which are included in the research work on demographic models or which can be studied through them. Among the examples, nos. 1 , 2 , 3 , 7 , and 8 are of special interest for analyzing the demographic situation in less developed countries and for development planning in such areas.

Examples of research projects.

1. The reduction of mortality from a specific cause of death affects the general mortality rates differently at different ages. This happens gradually during a period of time. It is desirable to follow how this development gradually affects the stable age distribution and thus all factors in a population and in a society varying with age.

2. An extended educational program causes a delayed entrance into the labour force. On the other hand, improved education and vocational training means increased rates of "climbing in productive categories". By schematic assumptions in this regard, the influence on the national product can be studied as well as changes in the structure of demand for different categories of commodities and services.

3. The improvement in certain diseases means both a reduction in the duration of the sick individuals' withdrawal from work and a reduction in mortality. Both effects have an influence on the national product and on the economic demands

4. The correlation between economic cycles on the one hand and nuptiality and fertility on the other leads to demographic cycles. A great variety of typical situations can be distinguished, of great interest in general and especially for improving methods of population forecasting. Through demographic models it becomes possible to make forecasts with allowance for short-time variations in the various variables and above all with inclusion of economic factors.

5. Improved or worsened economic conditions or changed psychological attitudes may cause more or less permanent changes in nuptiality. This affects the reproduction, the stable age distribution, the demand for homes etc. As a special question one may wish to investigate how much the national product is changed if nuptiality is stimulated through governmental economic measures of a given amount.

6. With reduced infant mortality there follows partly a greater time-distance between successive births. How does this affect reproduction, ceteris paribus?

7. Combinations of different preventive measures, sterilization and legal abortions can be used for obtaining control of population increase. Through models one may find out which possibilities are realistic under various assumptions of effectiveness in the methods, the attitudes of different population groups etc.

8. A rapid spread of knowledge about preventive measures and means may lead to what can be called a "temporarily depressed fertility pattern". This is a possible and perhaps highly probable development in certain less developed areas. Its social, economic and political implications have, however, not been studied, but plans for such a study are being worked out as part of the research on population trends and economic development in less developed countries.

559 E - Oct. 1962 - 1,600